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Interventions for increasing fruit and vegetable consumption in children aged five years and under (Review)

Hodder RK, O'Brien KM, Stacey FG, Tzelepis F, Wyse RJ, Bartlem KM, Sutherland R, James EL, Barnes C, Wolfenden L

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[Intervention Review]

Interventions for increasing fruit and vegetable consumption in children aged five years and under

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ABSTRACT

Background

Insufficient consumption of fruits and vegetables in childhood increases the risk of future non-communicable diseases, including cardiovascular disease. Interventions to increase consumption of fruit and vegetables, such as those focused on specific child-feeding strategies and parent nutrition education interventions in early childhood may therefore be an effective strategy in reducing this disease burden.

Objectives

To assess the effectiveness, cost effectiveness and associated adverse events of interventions designed to increase the consumption of fruit, vegetables or both amongst children aged five years and under.

Search methods

We searched CENTRAL, MEDLINE, Embase and two clinical trials registries to identify eligible trials on 25 August 2019. We searched Proquest Dissertations and Theses in May 2019. We reviewed reference lists of included trials and handsearched three international nutrition journals. We contacted authors of included trials to identify further potentially relevant trials.

Selection criteria

We included randomised controlled trials, including cluster-randomised controlled trials and cross-over trials, of any intervention primarily targeting consumption of fruit, vegetables or both among children aged five years and under, and incorporating a dietary or biochemical assessment of fruit or vegetable consumption. Two review authors independently screened titles and abstracts of identified papers; a third review author resolved disagreements.

Data collection and analysis

Two review authors independently extracted data and assessed the risks of bias of included trials; a third review author resolved disagreements. Due to unexplained heterogeneity, we used random-effects models in meta-analyses for the primary review outcomes where we identified sufficient trials. We calculated standardised mean differences (SMDs) to account for the heterogeneity of fruit and

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vegetable consumption measures. We conducted assessments of risks of bias and evaluated the quality of evidence (GRADE approach) using Cochrane procedures.

Main results

We included 78 trials with 214 trial arms and 13,746 participants. Forty-eight trials examined the impact of child-feeding practices (e.g. repeated food exposure) in increasing child vegetable intake. Fifteen trials examined the impact of parent nutrition education in increasing child fruit and vegetable intake. Fourteen trials examined the impact of multicomponent interventions (e.g. parent nutrition education and preschool policy changes) in increasing child fruit and vegetable intake. Two trials examined the effect of a nutrition education intervention delivered to children in increasing child fruit and vegetable intake. One trial examined the impact of a child-focused mindfulness intervention in increasing vegetable intake.

We judged 20 of the 78 included trials as free from high risks of bias across all domains. Performance, detection and attrition bias were the most common domains judged at high risk of bias for the remaining trials.

There is very low-quality evidence that child-feeding practices versus no intervention may have a small positive effect on child vegetable consumption equivalent to an increase of 4.45 g as-desired consumption of vegetables (SMD 0.42, 95% CI 0.23 to 0.60; 18 trials, 2004 participants; mean post-intervention follow-up = 8.2 weeks). Multicomponent interventions versus no intervention has a small effect on child consumption of fruit and vegetables (SMD 0.34, 95% CI 0.10 to 0.57; 9 trials, 3022 participants; moderate-quality evidence; mean post-intervention follow-up = 5.4 weeks), equivalent to an increase of 0.36 cups of fruit and vegetables per day. It is uncertain whether there are any short-term differences in child consumption of fruit and vegetables in meta-analyses of trials examining parent nutrition education versus no intervention (SMD 0.12, 95% CI −0.03 to 0.28; 11 trials, 3078 participants; very low-quality evidence; mean post-intervention follow-up = 13.2 weeks). We were unable to pool child nutrition education interventions in meta-analysis; both trials reported a positive intervention effect on child consumption of fruit and vegetables (low-quality evidence).

Very few trials reported long-term effectiveness (6 trials), cost effectiveness (1 trial) and unintended adverse consequences of interventions (2 trials), limiting their assessment. Trials reported receiving governmental or charitable funds, except for four trials reporting industry funding.

Authors' conclusions

Despite identifying 78 eligible trials of various intervention approaches, the evidence for how to increase children's fruit and vegetable consumption remains limited. There was very low-quality evidence that child-feeding practice may lead to, and moderate-quality evidence that multicomponent interventions probably lead to small increases in fruit and vegetable consumption in children aged five years and younger. It is uncertain whether parent nutrition education interventions are effective in increasing fruit and vegetable consumption in children aged five years and younger. Given that the quality of the evidence is very low or low, future research will likely change estimates and conclusions. Long-term follow-up of at least 12 months is required and future research should adopt more rigorous methods to advance the field.

This is a living systematic review. Living systematic reviews offer a new approach to review updating, in which the review is continually updated, incorporating relevant new evidence as it becomes available. Please refer to the *Cochrane Database of Systematic Reviews* for the current status of this review.

PLAIN LANGUAGE SUMMARY

Interventions for increasing eating of fruit and vegetables in children aged five years and under

Background

Not eating enough fruit and vegetables is a considerable health burden in developed countries. Eating adequate amounts of fruit and vegetables is associated with a reduced risk of future non-communicable diseases (such as cardiovascular disease). Early childhood represents a critical period for the establishment of dietary habits that track into adulthood. Interventions to increase consumption of fruit and vegetables in early childhood may therefore be an effective strategy to reduce this disease burden.

Review question

To assess the impact of interventions designed to increase eating of fruit or vegetables or both among children aged five years and under.

Methods

We searched various electronic databases and relevant journals to find trials. We contacted authors of included trials for additional potentially relevant trials. Any randomised trial (participants have the same chance of being assigned to treatment or control) of interventions aiming to increase the intake of fruit or vegetables or both by children aged five years and under that measured intake was eligible. Two review authors independently searched for and extracted information from trials. The evidence is current to August 2019.

Results

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We included 78 trials with 13,746 people taking part. Forty-eight trials examined child-feeding practice interventions (e.g. repeated exposure to vegetables), 15 examined parent nutrition education interventions, 14 examined multicomponent interventions (e.g. combining preschool policy changes with parent education), two examined child nutrition education interventions and one examined a child-focused mindfulness intervention. Child-feeding practice interventions may lead to, and multicomponent interventions probably lead to, small increases in children's intake of fruit and vegetables in the short term (less than 12 months). It is uncertain whether parent nutrition education interventions are effective in increasing children's eating of fruit and vegetables. There was not enough information to assess long-term effectiveness, cost effectiveness and unintended harms. Trials reporting funding support received governmental or charitable funds, except for four trials that received industry funding.

Conclusions

Child-feeding practices may increase fruit and vegetable intake by children (by 4.45 g per day), however this conclusion is based on very-low quality evidence and is very likely to change when future research is undertaken. Multicomponent interventions probably increase fruit and vegetable intake by children (by 0.36 cups per day) based on the moderate quality of the evidence, however this may also change when future research is undertaken. It is uncertain whether parent nutrition education interventions increase children's fruit and vegetable intake.

This is a living systematic review. Living systematic reviews offer a new approach to review updating, in which the review is continually updated, incorporating relevant new evidence as it becomes available. Please refer to the *Cochrane Database of Systematic Reviews* for the current status of this review.

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SUMMARY OF FINDINGS

Summary of findings for the main comparison. Child-feeding interventions compared to no intervention for children aged five years and under

Child-feeding interventions compared to no intervention for children aged five years and under

Patient or population: children aged five years and under
Setting: various: preschool (n = 5), school (n = 1), home + lab (n = 2), child health clinic (n = 1), home (n = 5), home + health facility (n = 2), preschool + primary school (n=1), early intervention agency (n = 1), kindergartens (n = 1)
Intervention: child-feeding interventions
Comparison: no intervention

Outcomes	Anticipated absolute effects* (95% CI)		Relative effect (95% CI)	№ of participants (trials)	Quality of the evidence (GRADE)	Comments
	Risk with no intervention	Risk with child-feeding interventions				
Child vegetable intake Short-term impact (< 12 months)	The mean as-desired vegetable intake was 7.7 grams[1]	The mean as-desired vegetable intake (grams) in the intervention group was **4.45 higher** (2.44 higher to 6.37 higher)	-	2004 (18 RCTs)	⊕⊖⊖⊖ Very low[2,3,4]	Scores estimated using a standardised mean difference of 0.42 (0.23 to 0.60) and a standard deviation of 10.61.[1] The mean duration of follow-up post-intervention for trials included in the meta-analysis was 8.2 weeks. We could not synthesise 1 study in meta-analysis. Harnack 2012 compared ≥ 1 child-feeding practice interventions to a no-treatment control and reported a significant increase in intake of fruit.
Cost effectiveness Short-term impact (< 12 months) Not reported	No child-feeding interventions reported this outcome		-	-	-	-
Unintended adverse events	One trial (Spill 2011a) reported no adverse effects on amount of meals consumed		-	39 (1 RCT)	⊕⊖⊖⊖ Very low[5,6,7]	-

Short-term impact (< 12 months)		

*The risk in the intervention group (and its 95% confidence interval) is based on the assumed risk in the comparison group and the **relative effect** of the intervention (and its 95% CI)

CI: confidence interval; **RCT:** randomised controlled trial

GRADE Working Group grades of evidence
High quality: we are very confident that the true effect lies close to that of the estimate of the effect
Moderate quality: we are moderately confident in the effect estimate: the true effect is likely to be close to the estimate of the effect, but there is a possibility that it is substantially different
Low quality: our confidence in the effect estimate is limited: the true effect may be substantially different from the estimate of the effect
Very low quality: we have very little confidence in the effect estimate: the true effect is likely to be substantially different from the estimate of effect

[1]We used the post-intervention mean and standard deviation of the control group from Wardle 2003a for the risk with no intervention and to re-express the standardised mean difference in terms of grams of intake.
[2]Downgraded one level for unexplained heterogeneity: Analysis 1.1 (main analysis): I^2 = 68%; test for subgroup differences by modality: Chi^2 = 0.01, df = 1 (P = 0.90), I^2 = 0%, Analysis 1.5; test for subgroup differences by setting: Chi^2 = 2.37, df = 3 (P = 0.50), I^2 = 0%, Analysis 1.6.
[3]Downgraded one level for risk of bias: fewer than half of the included trials were rated at low risk of bias for three of four criteria.
[4]Downgraded one level for high probability of publication bias: we did not combine most included trials in meta-analysis.
[5]Downgraded one level for risk of bias: due to being assessed as high risk of bias across multiple domains.
[6]Downgraded one level for imprecision: total sample size was fewer than 400 participants.
[7]Downgraded one level for high probability of publication bias: no other trials reported assessing adverse events, so selective reporting suspected.

Summary of findings 2. Parent nutrition education interventions compared to no intervention for children aged five years and under

Parent nutrition education interventions compared to no intervention for children aged five years and under

Patient or population: children aged five years and under
Setting: various: parenting group (n = 1), home (n = 4), primary care clinic (n = 1), community health centre (n = 1), preschool (n = 2), preschool + home (n = 1), clinic + home (n = 1)
Intervention: parent nutrition education interventions
Comparison: no intervention

Outcomes	Anticipated absolute effects* (95% CI)		Relative effect (95% CI)	№ of participants (trials)	Quality of the evidence (GRADE)	Comments
	Risk with no intervention	Risk with parent nutrition education interventions				

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Child fruit and vegetable intake Short-term impact (< 12 months)	The mean servings of vegetables per day was 1.6[1]	The mean servings of vegetables per day in the intervention group was **0.12 higher** (0.03 lower to 0.28 higher)	-	3078 (11 RCTs)	⊕⊝⊝⊝ Very low[2,3,4]	Scores estimated using a standardised mean difference of 0.12 (−0.03 to 0.28) and a standard deviation of 1.0[1] The mean duration of follow-up post-intervention for trials included in the meta-analysis was 13.2 weeks. We were unable to pool results of 4 trials that reported mixed results in the meta-analysis. 1 trial found a mHealth nutrition intervention to be effective in increasing skin carotenoid levels compared to control (Bakırcı-Taylor 2019). 1 trial found a parent-responsivity and behaviour-management intervention to be effective in increasing total fruit intake compared to control (Black 2011); 1 study found a parent health report on fruit and vegetable consumption to be effective in increasing total vegetable intake compared to control, but not fruit (Hunsaker 2017); and 1 study found both a parent-complementary feeding intervention and a parent-complementary feeding and home-visit intervention to be effective in increasing both fruit and vegetable intake compared to control (Vazir 2013).
Cost effectiveness Short-term impact (< 12 months)	1 trial (Campbell 2013) reported information regarding intervention costs		-	389 (1 RCT)	⊕⊝⊝⊝ Very low[5,6,7]	-
Unintended adverse events Short-term impact (< 12 months)	One trial (Wyse 2012) reported no adverse effect on family food expenditure		-	343 (1 RCT)	⊕⊝⊝⊝ Very low[5, 6, 8]	-

*__The risk in the intervention group__ (and its 95% confidence interval) is based on the assumed risk in the comparison group and the **relative effect** of the intervention (and its 95% CI).

CI: Confidence interval; **RCT:** randomised controlled trial

GRADE Working Group grades of evidence
High quality: we are very confident that the true effect lies close to that of the estimate of the effect
Moderate quality: we are moderately confident in the effect estimate: the true effect is likely to be close to the estimate of the effect, but there is a possibility that it is substantially different
Low quality: our confidence in the effect estimate is limited: the true effect may be substantially different from the estimate of the effect

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Very low quality: we have very little confidence in the effect estimate: the true effect is likely to be substantially different from the estimate of effect

[1]We used the post-intervention mean and standard deviation of the control group from Skouteris 2015 for the risk with no intervention and to re-express the standardised mean difference in terms of servings of vegetables per day.
[2]Downgraded one level for unexplained heterogeneity: Analysis 2.1 (main analysis): I^2 = 69%; test for subgroup differences by modality: Chi^2 = 2.39, df = 2 (P = 0.30), I^2 = 16.2%, Analysis 2.4; test for subgroup differences by setting: Chi^2 = 1.02, df = 2 (P = 0.60), I^2 = 0% Analysis 2.5.
[3]Downgraded one level for risk of bias: most trials were at high risk of bias for lack of blinding, and fewer than half were at low risk of bias for other methodological limitations.
[4]Downgraded one level for imprecision: the confidence intervals contained the null value.
[5]Downgraded one level for risk of bias: study assessed as high risk of bias for a number of domains.
[6]Downgraded one level for imprecision: total sample size was fewer than 400 participants.
[7] Downgraded one level for high probability of publication bias: no other trials reported cost effectiveness, so selective reporting suspected.
[8] Downgraded one level for high probability of publication bias: no other trials reported assessing adverse events, so selective reporting suspected.

Summary of findings 3. Multicomponent interventions compared to no intervention for children aged five years and under

Multicomponent interventions compared to no intervention for children aged five years and under

Patient or population: children aged five years and under
Setting: various: preschool (n = 3), school (n = 1), preschool + home (n = 2), home (n = 1), kindergartens (n = 1), home + kindergartens (n = 1)
Intervention: multicomponent interventions
Comparison: no intervention

Outcomes	Anticipated absolute effects* (95% CI)		Relative effect (95% CI)	№ of participants (trials)	Quality of the evidence (GRADE)	Comments
	Risk with no intervention	Risk with multicomponent interventions				
Child fruit and vegetable intake Short-term impact (< 12 months)	The mean cups of vegetables per day was 1.08[1]	The mean cups of vegetables per day in the intervention group was **0.36 higher** (0.11 higher to 0.60 higher)	-	3022 (9 RCTs)	⊕⊕⊕⊖ Moderate[2]	Scores estimated using a standardised mean difference of 0.34 (0.10 to 0.57) and a standard deviation of 1.05[1] The mean duration of follow-up post-intervention for trials included in the meta-analysis was 5.4 weeks We could not pool 5 trials in meta-analysis. 3 reported significant increases in both fruit and vegetable consumption, 1 reported a significant increase on fruit but not vegetable consumption, and 1 reported a significant increase in fruit consumption in the intervention but not control group, with no between-group comparisons reported.

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Cost effectiveness Short-term impact (< 12 months) Not reported	No trials reported this outcome	-	-	-	-
Unintended adverse events Short-term impact (< 12 months) Not reported	No trials reported this outcome	-	-	-	-

*__The risk in the intervention group__ (and its 95% confidence interval) is based on the assumed risk in the comparison group and the **relative effect** of the intervention (and its 95% CI).

CI: Confidence interval

GRADE Working Group grades of evidence
High quality: we are very confident that the true effect lies close to that of the estimate of the effect
Moderate quality: we are moderately confident in the effect estimate: the true effect is likely to be close to the estimate of the effect, but there is a possibility that it is substantially different
Low quality: our confidence in the effect estimate is limited: the true effect may be substantially different from the estimate of the effect
Very low quality: we have very little confidence in the effect estimate: the true effect is likely to be substantially different from the estimate of effect

[1]We used the post-intervention mean and standard deviation of the control group from Williams 2014 for the risk with no intervention and to re-express the standardised mean difference in terms of cups of vegetables per day.
[2]Downgraded one level for risk of bias: fewer than half of the included trials were rated at low risk of bias for two of four criteria.

Summary of findings 4. Child nutrition education interventions compared to no intervention for children aged five years and under

Child nutrition education interventions compared to no intervention for children aged five years and under

Patient or population: children aged five years and under
Setting: preschool (n = 2)
Intervention: child nutrition education interventions
Comparison: no intervention

Outcomes	Anticipated absolute effects* (95% CI)	Relative effect (95% CI)	№ of participants (trials)	Quality of the evidence (GRADE)	Comments

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	Risk with no intervention	Risk with child nutrition education interventions				
Child fruit and vegetable intake Short-term impact (< 12 months)	-	-	-	292 (2 RCTs)	⊕⊕⊝⊝ Low[1,2]	We could not synthesise these 2 trials in meta-analysis. One study (Baskale 2011), reported an increase in some of the fruits and vegetables assessed in the intervention group and no significant differences in the control group. The other study reported a positive effect on vegetable intake (Nekitsing 2019b). The mean duration of follow-up post-intervention was 16 weeks.
Cost or cost effectiveness Not reported	No trials reported this outcome		-	-	-	-
Unintended adverse events Not reported	No trials reported this outcome		-	-	-	-

*__The risk in the intervention group__ (and its 95% confidence interval) is based on the assumed risk in the comparison group and the **relative effect** of the intervention (and its 95% CI).

CI: Confidence interval; **RCT:** randomised controlled trial

GRADE Working Group grades of evidence
High quality: we are very confident that the true effect lies close to that of the estimate of the effect
Moderate quality: we are moderately confident in the effect estimate: the true effect is likely to be close to the estimate of the effect, but there is a possibility that it is substantially different
Low quality: our confidence in the effect estimate is limited: the true effect may be substantially different from the estimate of the effect
Very low quality: we have very little confidence in the effect estimate: the true effect is likely to be substantially different from the estimate of effect

[1]Downgraded one level for risk of bias: high risk of bias due to lack of blinding and loss to follow-up.
[2]Downgraded one level for imprecision: total sample size fewer than 400 participants.

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BACKGROUND

Description of the condition

Insufficient consumption of fruit and vegetables is associated with a range of non-communicable diseases, such as cancer and cardiovascular disease (Boeing 2012; Branca 2019; Global Burden of Disease 2017; Hartley 2013; Micha 2015; World Health Organization 2011; World Health Organization 2019). Globally, 2.8% of all deaths and 1.0% of all disability-adjusted life years (DALYs) each year are attributable to inadequate fruit and vegetable intake (World Health Organization 2017). Low fruit and vegetable consumption is responsible for 14% of gastrointestinal cancer deaths, 11% of all ischaemic heart disease and 9% of all stroke deaths (World Health Organization 2017) and as a result is a public health priority.

The daily amount of fruit and vegetables recommended for children aged five years and younger varies internationally. For example, in the USA 1 cup of fruit and 1.5 cups of vegetables is recommended respectively for children aged two to three years and four to eight years (US Department of Health and Human Services 2015). Whereas in Australia, 0.5 to 1.15 servings of fruit (75 g to 113 g) and 2 to 4.5 servings of vegetables (150 g to 338 g) are recommended for children aged one to two years, two to three years and four to eight years (National Health and Medical Research Council 2013). Population surveys of children indicate that such recommendations are not currently being met and there is a need to increase children's intake of fruit and vegetables (Australian Bureau of Statistics 2014; Inchley 2016; Lynch 2014; Lock 2005; National Cancer Institute 2015; World Health Organization 2014). For example, just over a third of school-aged children from European nations report consuming vegetables on a daily basis (Inchley 2016). Data from younger children are similar. A survey conducted in 2007 to 2010 in the USA reported that 33% of children aged one to three years met fruit recommendations and 13% met vegetable recommendations (National Cancer Institute 2015). A national survey conducted in 2011 and 2012 in Australia reported that 90% of children aged two to eight years consumed the recommended number of fruit servings a day, however only 49% of children aged two to three years consumed the recommended servings of vegetables (Australian Bureau of Statistics 2014). Globally, the mean intake of fruit and vegetables is below the World Health Organization (WHO) recommendations across all WHO regions. South American, African, and South East Asian nations report the lowest quantities of child fruit and vegetable intake, where school-aged children typically consume less than 300 g a day (Lock 2005).

There is some evidence from longitudinal trials to suggest that eating behaviours established in childhood are likely to persist into adulthood (Albuquerque 2018; Craigie 2011; Winpenny 2018). Follow-up data at 37 years from the Boyd Orr cohort trial of British children, for example, found lower rates of all-cause cardiovascular mortality among children with greater intake of vegetables in childhood (Ness 2005). Additionally, longitudinal trials have shown that fruit and vegetable consumption in childhood is associated with reductions in non-communicable diseases in adulthood (Maynard 2003; Ness 2005). Encouraging healthy eating among children may therefore represent an effective primary prevention strategy for reducing the risk of non-communicable diseases (Boeing 2012; Centers for Disease Control and Prevention 2011; Maynard 2003; Ness 2005; World Health Organization 2004). Adequate fruit and vegetable intake during childhood may also have a number of immediate benefits, including reducing the risk of micronutrient deficiencies and a number of respiratory illnesses (Antova 2003; Boeing 2012; Forastiere 2005; World Health Organization 2003).

Description of the intervention

The aetiology of fruit and vegetable consumption is complex, involving the dynamic interaction of a variety of factors. Given such complexity, a number of frameworks have been produced to guide the development of interventions to increase fruit and vegetable intake (Centers for Disease Control and Prevention 2011; Klepp 2005; Miller 2000; World Health Organization 2004). For example, the conceptual framework developed for the international Pro Children Project suggests that a variety of cultural, physical, social environment and personal factors, that operate at multiple levels, influence children's intake of fruit and vegetables (Klepp 2005). These can include macro national-level influences such as national-level food policies, the availability of promotion of fruits and vegetables in community settings and organisations, family child-feeding practices, and individual habit, liking, self-efficacy and knowledge (Rasmussen 2006).

Despite the range of potential intervention targets, previous trials have tended to focus on those determinants more amenable to intervention, such as nutrition knowledge and skills, or the food environment of settings such as childcare services and the home (Hendrie 2017). Previous reviews in children aged five years and younger (Campbell 2007; Hesketh 2010; Tedstone 1998), have found some evidence for multicomponent interventions and interventions that were undertaken across a broader range of settings (Hendrie 2017). For example, an intervention aiming to prevent the onset of cardiovascular disease in preschoolers targeted multiple risk factors, including child fruit and vegetable consumption (Peñalvo 2013a; Peñalvo 2013b). The multicomponent intervention including curriculum, school environment and family components successfully improved preschoolers' fruit and vegetable habits, which were also maintained over time (Peñalvo 2013a; Peñalvo 2013b; Peñalvo 2015). Interventions that target improved availability of fruits and vegetables in home and community settings have also been suggested as effective in reviews of interventions in low- and middle-income countries (Sirasa 2019). Similarly a review of methods for increasing vegetable consumption in two- to five-year-old children reported that strategies such as repeated exposure, modelling and incentivising tasting with non-food rewards represented the most promising approaches parents could employ to improve child vegetable intake (Holley 2017).

How the intervention might work

A number of theories have been used to explain the mechanisms by which interventions may influence children's fruit and vegetable consumption (Rasmussen 2006). In most instances, psychosocial theories such as Social Cognitive Theory (Bandura 1986), the Theory of Planned Behaviour (Ajzen 1991), or the Stages of Change Trans-theoretical Model (Prochaska 1984), have been used to explain possible causal pathways to fruit and vegetable consumption (Rasmussen 2006). Collectively, such theories assert that changes in attitudes, knowledge and skills and perceived norms and expectancies are required for behavioural change. Despite their use, we were unable to identify any trials reporting the extent to which these theoretical constructs explain changes

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in fruit and vegetable consumption in children aged under five years following intervention. However, mediation analysis of broader dietary intervention for mothers of infants, revealed that higher maternal feeding knowledge and lower use of foods as rewards mediate the effects of the intervention on the nutritional quality of child diet (Spence 2014). In school-aged children there is some support for theoretically based interventions, including the theory of planned behaviour (Gratton 2007), however, systematic reviews examining the theoretical mechanisms of dietary behavior change in youth suggest they are relatively unsuccessful in changing mediators with self-efficacy and outcome expectations the mechanisms most consistently associated with dietary behaviour change (Cerin 2009).

The international Pro Children Project incorporated Social-Ecological Model in its conceptual theoretical framework of determinants of children's fruit and vegetable consumption (Klepp 2005). Interventions derived from Social-Ecological Model recognise the importance of more structural influences on children's intake of fruit and vegetable consumption, for example, the availability or accessibility of fruit and vegetables in the home or in settings frequented by children, such as schools. To our knowledge, only one trial of a fruit and vegetable intervention has examined factors that mediate intervention effects. The randomised trial of a telephone-based intervention for parents of children aged three to five years was developed based on socio-ecological theory. Mediation analysis found that parent fruit and vegetable intake and parent provision of these foods mediated the effects of the intervention (Wyse 2015).

More recently, system science approaches have sought to describe broader systems-based determinants of fruit and vegetable intake in children aged 2 to 14 years and catalyse community action to increase intake through community-based participatory research processes. In New Zealand, for example, system maps have been developed by community coalitions including students, parents, community leaders, health promotion practitioners and retailers specifying the causal pathways for identifying actions that may be taken to improve population-level intake of child fruit and vegetables (Gerritsen 2019a). The process identified a range of factors suggested to be causally related to child fruit and vegetable consumption including food marketing, price of fruit and vegetables, and limited food preparation time and skills of parents. Similarly, qualitative systems dynamics' method of cognitive mapping applied with national food system actors on New Zealand identified subsidising fruit and vegetables and intervention in early childhood as particularly promoting strategies to improve child fruit and vegetable intake. However, such system maps are yet to be empirically tested (Gerritsen 2019b).

In addition to improving the dietary outcomes of children, there remains the potential that fruit and vegetable interventions could have unintended adverse outcomes. While it has been recommended that intervention logic models also consider potential adverse effects (Bonell 2015), rarely are these included in programme theories, measured or reported in trials of health interventions (Hopewell 2008; Wolfenden 2019). A range of potential adverse outcomes, however, could be hypothesised for interventions targeting children under five years. For example, the costs of fruit and vegetables is frequently reported as a barrier to their intake (Chapman 2017). Promotion of greater consumption, therefore, could increase financial stress and hardship among socio-economically disadvantaged families. Furthermore, the introduction of fruit and vegetable curricula into childcare services may displace other important learning opportunities for children in these settings. The potential benefits of public health interventions must be weighed against their potential for harm. To adequately inform public health decision making, measures of benefit and potential harm, including cost effectiveness, should be hypothesised and reported in trials of fruit and vegetable interventions, and reviews that synthesise this evidence.

Why it is important to do this review

Previous reviews have identified a number of factors associated with fruit and vegetable consumption among children (Blanchette 2005; Pearson 2008; Rasmussen 2006; Van der Horst 2007). While such reviews provide important information for the development of interventions, only systematic reviews of intervention trials can determine the effectiveness of strategies to increase child fruit and vegetable consumption. A number of such reviews have been published (Burchett 2003; Ciliska 2000; Delgado-Noguera 2011; De Sa 2008; Evans 2012; French 2003; Hendrie 2017; Howerton 2007; Knai 2006; Savoie-Roskos 2017; Van Cauwenberghe 2010). However, only a few have focused specifically on children aged five years and under (Campbell 2007; Hesketh 2010; Tedstone 1998), with the most recent of these conducted in 2010. Despite these reviews reporting a positive effect of such interventions (Hesketh 2010; Tedstone 1998), most lacked important information relevant to practice, such as the effectiveness of interventions for various subpopulations (such as minority groups), the cost effectiveness of interventions, or the presence of any unintended adverse effects of the intervention. Similarly, as positive impacts of health behaviour interventions may not be sustained, an examination of the longer-term effectiveness of interventions (more than 12 months post-intervention) is important for policy-makers and practitioners to assess the potential health benefits of fruit and vegetable interventions (Fjeldsoe 2011; Jones 2011). Previous reviews have not specifically examined the impact of interventions based on the length of post-intervention follow-up. A comprehensive systematic review on this issue is therefore required to provide guidance for practitioners and policy-makers interested in implementing strategies to promote the consumption of fruits and vegetables in early childhood.

Following the publication of the 2017 update of this review, we will maintain it as a living systematic review. This means we will be continually running the searches and rapidly incorporating any newly identified evidence into the review (for more information about the living systematic review approach piloted by Cochrane that this review was a part of, see Appendix 1). We believe a living systematic review approach is appropriate for this review, for three reasons. First, the review addresses a particularly important public health issue; the growing burden of disease and mortality attributable to low fruit and vegetable intake. Insufficient consumption of fruits and vegetables is associated with a range of non-communicable diseases such as cancer and cardiovascular disease, and in most regions of the globe current daily consumption of fruits and vegetables is well below the recommended intake to reduce the risk of non-communicable diseases. Early childhood represents a critical period for the establishment of healthy eating behaviours, such as fruit and vegetable intake, as dietary habits developed early are likely to persist into adulthood. It is therefore important to better understand how to improve intake

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of fruits and vegetables during childhood. Secondly, there remains uncertainty in the existing evidence; despite searches including the current update (up to 25 August 2019) identifying 78 trials for inclusion in the review, no high-quality evidence exists of effective interventions to increase the fruit and vegetable consumption of children. Thirdly, we are aware of multiple ongoing trials in this area of research that will be important to incorporate, and we expect that future research will have an impact on the conclusions.

OBJECTIVES

To assess the effectiveness, cost effectiveness and unintended adverse events of interventions designed to increase the consumption of fruit or vegetables or both among children aged five years and under.

METHODS

Criteria for considering studies for this review

Types of studies

Eligible trials were randomised controlled trials (RCTs), including cluster-randomised controlled trials (C-RCTs) and cross-over trials, that:

1. compared two or more alternative intervention programmes to increase the consumption of fruit or vegetables or both of children aged five years and under;
2. compared an intervention programme to increase the consumption of fruit or vegetables or both of children aged five years and under with a standard-care or no-intervention control group.

We excluded trials which did not include fruit or vegetable intake as a primary trial outcome, to avoid the potential confounding effects of other interventions, and because publication bias and selective outcome reporting are more predominant among secondary trial outcomes (or outcomes that were not otherwise stated). We included trials that did not state a primary trial outcome but did assess an eligible fruit or vegetable intake outcome. We included eligible cross-over trials in the review, as we deemed them a suitable and common method for assessing the effect of interventions to increase the fruit and vegetable consumption of children.

Types of participants

Participants could include:

1. children aged five years and under. Trials including children older than five years were included only if the mean age of the trial sample at baseline was five years or less;
2. parents, guardians and families responsible for the care of children aged five years and under;
3. professionals responsible for the care of children aged five years and under, including childcare staff and health professionals.

Types of interventions

We considered any educational, experiential, health promotion and/or psychological or family or behavioural therapy or counselling or management or structural or policy or legislative reform interventions, designed to increase consumption of fruit or vegetables or both in children aged five years and under (as defined in types of participants). Interventions could be conducted in any setting including the home, childcare/preschool services, health services, or community settings.

Comparison: Any alternative intervention to encourage fruit and vegetable consumption as described above, or a no-intervention control, usual care, or attention control or wait-list control. Attention controls in randomised trials for behavioural interventions are those that include clinical attention and induce the expectation of therapeutic benefit for control for non-specific effects of the intervention (Freedland 2011). Wait-list control groups that are also designed to control for non-specific effects involve participants being allocated to receive an intervention at trial conclusion (delayed start) (Whitehead 2004).

Types of outcome measures

We included trials with evaluated outcomes, measuring biomedical or dietary indices, or both, of the review's primary outcome.

Primary outcomes

The primary outcome was children's fruit and vegetable intake. Fruit and vegetable intake could be assessed using a variety of measures, including:

1. change in the number of portions or serves of daily fruit or vegetable or both at follow-up, as measured by diet recalls, food diaries, food frequency questionnaires or diet records completed by an adult on behalf of the child. We grouped the interventions by short-term effects (less than 12 months post-intervention) and long-term effects (at least 12 months post-intervention);
2. change in grams of fruit or vegetables or both at follow-up, as measured by diet recalls, food diaries, food frequency questionnaires or diet records completed by an adult on behalf of the child. We grouped them by short-term effects (less than 12 months post-intervention) and long-term effects (at least 12 months post-intervention);
3. changes in biomedical markers of consumption of fruit or vegetables or both, such as α-carotene, β-carotene, cryptoxanthin, lycopene and lutein. We grouped them by short-term effects (less than 12 months post-intervention) and long-term effects (12 months or more post-intervention).

Outcomes of fruit or vegetable juice intake alone were not eligible. Outcomes that included child fruit and vegetable juice intake as part of an aggregate measure of child fruit or vegetable intake were eligible.

Secondary outcomes

1. Estimates of absolute costs and cost effectiveness of interventions to increase the consumption of fruits and vegetables reported in identified trials.
2. Any reported adverse effects of an intervention to increase the consumption of fruits and vegetables reported in identified trials. This could include any physical, behavioural, psychological or financial impact on the child, parent or family, or the service or facility where an intervention may have been implemented.

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Search methods for identification of studies

This review represents the fourth update of a review first published in 2012 (Wolfenden 2012), and updated in 2017 (Hodder 2017), January 2018 (Hodder 2018a), and May 2018 (Hodder 2018b).

Electronic searches

We searched the following electronic databases between 25 January 2018 and 25 August 2019 to identify any relevant trials added since the last published review (Hodder 2018b):

1. Cochrane Central Register of Studies (CENTRAL, via CRS-Web);
2. Epub Ahead of Print, In-Process & Other Non-Indexed Citations, MEDLINE Daily and MEDLINE (Ovid, 1946 to 23 August 2019);
3. Embase (Ovid, 1980 to 2019 Week 34).

As a living systematic review, we are conducting monthly searches of these databases, for which we have set up auto-alerts to deliver monthly search yields, where possible.

We had previously conducted electronic searches of CINAHL (EBSCO, 1937 to 5 July 2016; searched 5 July 2016) and PsycINFO (Ovid, 1806 to June week 5 2016; searched 5 July 2016; Hodder 2017) .

The search strategies are described in Appendix 2. We applied the sensitivity-maximising version of the Cochrane RCT filter (Lefebvre 2011) to MEDLINE, and adaptations of it to the other databases except for CENTRAL. We imposed no restrictions by date or language of publication.

Searching other resources

We searched the reference lists of included articles and handsearched all articles published between September 2017 and March 2019 in three relevant international peer-reviewed journals (*Journal of Nutrition Education and Behavior, Public Health Nutrition,* and *Journal of the Academy of Nutrition and Dietetics* (previously titled *Journal of the American Dietetic Association)*).

We are now running monthly trial registry searches of the WHO International Clinical Trials Registry Platform (www.who.int/ictrp/) and ClinicalTrials.gov (www.clinicaltrials.gov), which we last conducted in August 2019. In September 2016 we also searched a third clinical trials register, the metaRegister of clinical trials (www.isrctn.com/page/mrct).

We also searched a database of published dissertations (Proquest Dissertations and Theses) in May 2019 and GoogleScholar in June 2019.

We contacted the authors of included trials to try to obtain other eligible trials published in peer-reviewed journals, as well as ongoing trials. We describe ongoing trials, where available, detailing the primary author, research question(s), methods and outcome measures (Characteristics of ongoing studies).

As this is a living systematic review, we will continue to handsearch the three journals listed above, and the database of published dissertations and 'grey literature' in GoogleScholar manually every six months.

As additional steps to inform the living systematic review, we will contact corresponding authors of ongoing trials as they are identified and ask them to advise when results are available, or to share early or unpublished data. We will contact the corresponding authors of any newly included trials for advice as to other relevant trials. We will conduct citation tracking of included trials in Web of Science Core Collection on an ongoing basis. For that purpose, we have set up citation alerts in Web of Science Core Collection. We will manually screen the reference lists of any newly included trials.

We will review search methods and strategies approximately yearly, to ensure they reflect any terminology changes in the topic area, or in the databases.

Data collection and analysis

Selection of studies

Two review authors (RH, KO) independently screened titles and abstracts of identified papers. Review authors were not blinded to the details of the trial author or journal. Review authors applied a standardised screening tool to assess eligibility. We screened articles against the eligibility criteria of participants (mean age of children more than five years), outcome (primary outcome was not fruit and vegetable intake), comparator (was not a no-intervention, usual care, attention or wait-list control), intervention (did not aim to increase child fruit or vegetable intake) and trial type (was not RCT, C-RCT or cross-over trial with random allocation to group). Based on the title and abstract, we excluded papers which clearly did not meet the eligibility criteria of the review. Two review authors (RH, KO) then independently examined the full text of all remaining articles. We documented Information regarding the reason for the ineligibility of any paper for which we reviewed the full text, and present it in the table 'Characteristics of excluded studies'. A third review author with expertise in review methodology (LW) resolved any disagreements between review authors on trial eligibility. For those papers which did not provide sufficient information to determine eligibility, we contacted the trial authors for clarification.

We will immediately screen any new citations retrieved by the monthly searches. As the first step of monthly screening, we will apply the machine learning classifier (RCT model) (Wallace 2017), available in the Cochrane Register of Studies (CRS-Web) (Cochrane 2017a). The classifier assigns a probability (from 0 to 100) to each citation of being a true RCT. For citations that are assigned a probability score of less than 10, the machine learning classifier currently has a specificity/recall of 99.987% (Wallace 2017). We will screen in duplicate and independently all citations that have been assigned a score from 10 to 100. Cochrane Crowd will screen citations that score 9 or less (Cochrane 2017b) and will return any citations that they deem to be potential RCTs to the review authors for screening.

Data extraction and management

Pairs of review authors (from KO, RW, KB, CB) independently extracted data from each included trial. Review authors were not blinded to the details of the trial author or journal. We recorded data on data extraction forms designed and piloted specifically for this review. Consultation with a third review author with expertise in review methodology (RH) resolved discrepancies between review authors about data extraction. We tried to contact authors of included papers in instances where the information required for data extraction was not available from the published report, or was unclear. One review author entered extracted data into the systematic review software Review Manager 5 (RevMan 5)

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(RH) and another review author checked it (KO). Where available, we extracted the following information from included trials:

1. Information on the trial, research design and methods, such as the trial authors; date of publication; date of trial initiation; trial duration; setting; number of participants; participants' age, gender, ethnicity, and socioeconomic position;
2. Information on the experimental conditions of the trial, such as the number of experimental conditions; intervention and comparator components; duration; number of contacts; modalities; interventionist; and integrity;
3. Information on the trial outcomes and results, such as rates of recruitment and attrition; sample size; number of participants per experimental condition; mean and standard deviation of the primary or secondary outcomes described above; any subgroup analyses by gender, population group or intervention characteristics; and analyses (including whether trials appropriately adjusted for clustering).

Assessment of risk of bias in included studies

Working in pairs, review authors KO, FS, FT and RS independently assessed the risks of bias in the included trials. We consulted a fourth review author (RH) with expertise in review methodology to resolve any disagreements between review authors. Review authors used the tool outlined in the *Cochrane Handbook for Systematic Reviews of Interventions* (Higgins 2017), to assess the risks of bias. The tool requires an explicit judgement by the review authors, based on trial information, about the risks of bias attributable to the generation of the random sequence, the allocation concealment, the blinding of participants, personnel and outcome assessors, the completeness of outcome data, selective reporting, and any other potential threats to validity. We also judged recruitment bias, baseline imbalance, loss of clusters and incorrect analysis for C-RCTs. Judgements on the risks of bias for each trial are recorded in the 'Risk of bias' tables accompanying the review.

Measures of treatment effect

Where meta-analyses were performed, we expressed the intervention effect for continuous outcomes as a mean difference (MD) where outcomes were reported using a standard metric (such as grams), and as a standardised mean difference (SMD) where outcomes were reported using different methods or metrics of fruit and vegetable intake (such as grams, grams per kilogram of body weight, and serves per day). Should dichotomous outcome data be reported in included trials in future updates we will attempt to synthesise them in meta-analyses and express the intervention effect as odds ratios.

Unit of analysis issues

We assessed cluster-randomised trials in the review for unit-of-analysis errors. Where cluster-randomised trials did not account for clustering, we contacted trial authors to provide intra-class correlation coefficients (ICCs) to allow calculation of design effects and effective sample sizes to enable individual-level pooling. Where ICCs were not available, we estimated a mean ICC from reported ICCs of included trials, and used it to calculate effective sample sizes.

Dealing with missing data

Where available, we reported outcomes of trials using an intention-to-treat analysis. If trials did not report intention-to-treat analyses, we reported as-treated analysis of trial outcomes. We explored the impact of including as-treated trial outcomes in meta-analysis for trials with a high rate of attrition (more than 20% for short-term outcomes) in sensitivity analyses (see below Sensitivity analysis). We contacted trial authors to obtain any missing data (e.g. standard deviations).

Assessment of heterogeneity

We assessed statistical heterogeneity by visual inspection of forest plots of the included trials, and calculation of the I^2 statistic where we were able to pool data from included trials (Higgins 2003). Due to the similarity in trial characteristics (e.g. type of participants, intervention or outcomes), we could not conduct subgroup analyses by trial characteristics to identify the source of substantial heterogeneity (defined as I^2 greater than 50%).

Assessment of reporting biases

We checked for reporting bias by visual inspection of the funnel plots.

Data synthesis

We assessed trial outcomes using a variety of dietary assessment tools and reported in various metrics, including vitamin C from fruit, fruit or vegetable serves, and grams of fruit or vegetable consumption, or both. We calculated SMDs (to account for variable outcome measures) for each comparison, using the generic inverse variance method in a fixed-effect meta-analysis model (where there was no or low statistical heterogeneity in the primary analysis) or a random-effects meta-analysis model (where there was unexplained heterogeneity in the primary analysis), using the Review Manager 5 (RevMan 5) software (Review Manager 2014). We selected post-intervention values over change-from-baseline data for inclusion in meta-analysis, to reduce the risk of selective reporting and to maximise the number of trials that could be pooled.

We synthesised trials that provided data suitable for pooling in meta-analyses grouped by intervention type (infant feeding, parent nutrition education, and multicomponent interventions). For trials with multiple intervention arms testing different intervention types, we included the relevant intervention arm and comparison group data in each relevant meta-analysis (for example, intervention versus control data were available and included in the infant feeding and multicomponent meta-analyses for Nekitsing 2019b). When trials reported multiple fruit or vegetable outcomes, we selected the stated primary trial outcome for inclusion in our meta-analyses, or if a primary outcome was not stated we selected the first reported outcome for inclusion. For trials that reported multiple follow-up points, we extracted data from the longest follow-up period for inclusion in meta-analyses.

We selected reported trial estimates that adjusted for potential confounding variables for inclusion in meta-analysis over reported estimates that did not adjust for potential confounding variables. Similarly, for C-RCTs that reported trial estimates that were unadjusted and adjusted for clustering, we preferred estimates that adjusted for clustering for inclusion in meta-analyses. For C-RCTs

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that did not report post-intervention trial estimates (and a relevant measure of variance) that accounted for clustering, we calculated a design effect and effective sample size using trial data (number of clusters, number of participants analysed) and a reported ICC from one of the included trials (vegetable intake: ICC 0.014, fruit intake: ICC 0.016; De Bock 2012). For such C-RCTs (De Coen 2012; Hong 2018b; Kobel 2019; Martinez-Andrade 2014; Namenek Brouwer 2013; Nekitsing 2019b; Nicklas 2017; O'Connell 2012; Roset-Salla 2016; Smith 2017; Verbestel 2014; Williams 2014; Zeinstra 2017; Zeinstra 2018), we entered the reported post-intervention outcome data (e.g. mean and standard deviation) and author-calculated effective sample sizes into RevMan 5 to calculate individual-level adjusted trial estimates to enable inclusion in meta-analyses. We tried to pool trials separately that compared two or more alternative interventions.

For cross-over trials, we tried to synthesise results separately from parallel RCTs, by pooling results from paired analyses that adjust for within-individual comparisons. If such data were not available, we combined results by pooling data from the first cross-over period (i.e. essentially a parallel RCT) with parallel RCTs.

In all instances where we could not combine data in a meta-analysis, we have provided a narrative summary of the trial findings according to the review objectives.

Whenever we find new evidence (i.e. trials, data or information) meeting the review inclusion criteria, we will continue to extract the data, assess risks of bias and incorporate it into the synthesis every three months, or as appropriate.

We will continue to incorporate any new trial data into existing meta-analyses using the standard approaches outlined in the Data synthesis section.

We did not adjust the meta-analyses to account for multiple testing, given that the methods related to frequent updating of meta-analyses are under development (Simmonds 2017).

'Summary of findings' tables and GRADE

We created 'Summary of findings' tables using the following outcomes.

1. Child fruit and vegetable intake. This could include changes in the number of portions or serves or grams of daily fruit or vegetable or both at follow-up, as measured by diet recalls, food diaries, food frequency questionnaires or diet records completed by an adult on behalf of the child; or changes in biomedical markers of consumption of fruit or vegetables or both, such as α-carotene, β-carotene, cryptoxanthin, lycopene and lutein.
2. Estimates of absolute costs and cost effectiveness of interventions to increase the consumption of fruit and vegetables reported in the included trials
3. Any reported adverse events of an intervention to increase the consumption of fruit and vegetables reported in the included trials. This could include any physical, behavioural, psychological or financial impact on the child, parent or family, or the service or facility where an intervention may have been implemented.

We have produced four 'Summary of findings' tables, one for each of the following comparisons:

1. child-feeding interventions compared to no-intervention control;
2. parent nutrition education interventions compared to no-intervention control;
3. multicomponent interventions compared to no-intervention control;
4. child nutrition education interventions compared to no-intervention control.

We used the five GRADE considerations (trial limitations, consistency of effect, imprecision, indirectness and publication bias) to assess the quality of a body of evidence as it relates to the trials that contribute data to the meta-analyses for the prespecified outcomes. We used methods and recommendations described in Section 8.5 (Higgins 2017), and Chapter 12 (Schünemann 2017), of the *Cochrane Handbook for Systematic Reviews of Interventions*, using GRADEpro GDT software (GRADEpro GDT). We justified all decisions to downgrade the quality of trials using footnotes, and made comments to aid the reader's understanding of the review where necessary. For each comparison where we had calculated a SMD, we re-expressed it based on the instrument used in the lowest risk of bias in that comparison (e.g. grams of vegetable intake or serves of vegetables a day), by multiplying the post-intervention standard deviation of the control group by the pooled SMD.

Two review authors (RH and KO), working independently, judged the quality of the evidence, with disagreements resolved by discussion or by involving a third review author (LW). We justified, documented and incorporated the judgements into the reporting of results for each outcome.

We extracted trial data, formatted our comparisons in data tables and prepared a 'Summary of findings' table before writing the results and conclusions of our review.

Subgroup analysis and investigation of heterogeneity

Where possible, we conducted subgroup analyses of interventions for the following subgroups, which we had planned a priori.

1. Interventions targeting boys and girls (not conducted)
2. Interventions targeting minority groups including indigenous populations (not conducted, described narratively)
3. Interventions delivered in various settings including health and children's services (conducted where possible for some comparisons and settings)
4. Interventions of varying intensities, defined in terms of the number and duration of intervention contacts or components (not conducted)
5. Interventions delivered in different modes, such as by telephone, the Internet or face-to-face (conducted for some comparisons and modalities, otherwise described narratively)

Sensitivity analysis

Where possible, we conducted sensitivity analyses to explore the impact on the overall assessment of treatment effects.

1. Excluding trials at high risk of bias (defined a priori)
2. Excluding trials not reporting an intention-to-treat analysis, with high rates of participant attrition defined as greater than 20% (defined a priori)

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3. Excluding trials that did not have a primary outcome of child fruit and vegetable, fruit or vegetable consumption (post hoc)

For the sensitivity analysis excluding trials that did not have a primary outcome of child fruit and vegetable, fruit or vegetable consumption, we considered trials to have a primary outcome of children's fruit and vegetable intake even when this was not explicitly stated if: children's fruit and vegetable intake was the only reported outcome, a sample size calculation for children's fruit and vegetable intake was reported, or children's fruit and vegetable intake was the first reported outcome.

Other

We will continue to review our scope and methods if appropriate in the light of potential changes in the topic area, or the evidence being included in the review (e.g. additional comparisons, interventions or outcomes, or new review methods available).

The review was piloted as a living systematic review up until March 2018 and continues to be maintained as a living systematic review.

RESULTS

Description of studies

See: Characteristics of included studies; Characteristics of excluded studies; Characteristics of ongoing studies.

Results of the search

We ran searches for the previous reviews (Wolfenden 2012; Hodder 2017; Hodder 2018a; Hodder 2018b), and this review update, which together generated a total of 27,751 citations (25,480 previous reviews; 2271 this review update). Screening of titles and abstracts for the review update identified 191 records (1574 in total, including 1383 from the previous reviews) for formal inclusion or exclusion (see Figure 1). Of these, 78 trials (Ahern 2019; Anzman-Frasca 2012; Bakırcı-Taylor 2019; Barends 2013; Baskale 2011; Black 2011; Blissett 2016; Campbell 2013; Carney 2018; Caton 2013; Cohen 1995; Cooke 2011; Correia 2014; Cravener 2015; Daniels 2014; De Bock 2012; De Coen 2012; de Droog 2014; de Droog 2017; de Wild 2013; de Wild 2015a; de Wild 2015b; de Wild 2017; Duncanson 2013; Farrow 2019; Fildes 2014; Fildes 2015; Fisher 2012; Forestell 2007; Gerrish 2001; Haire-Joshu 2008; Harnack 2012; Hausner 2012; Heath 2014; Hetherington 2015; Hong 2018a; Hong 2018b; Hunsaker 2017; Keller 2012; Kim 2018; Kling 2016; Kobel 2019; Kristiansen 2019; Lanigan 2017; Martinez-Andrade 2014; Mennella 2008; Namenek Brouwer 2013; Natale 2014a; Nekitsing 2019a; Nekitsing 2019b; Nicklas 2017; O'Connell 2012; Owen 2018; Remington 2012; Remy 2013; Roe 2013; Roset-Salla 2016; Savage 2012; Segura-Perez 2017; Sherwood 2015; Skouteris 2015; Smith 2017; Spill 2010; Spill 2011a; Spill 2011b; Staiano 2016; Sullivan 1994; Tabak 2012; Vazir 2013; Verbestel 2014; Vereecken 2009; Wardle 2003a; Watt 2009; Williams 2014; Witt 2012; Wyse 2012; Zeinstra 2017; Zeinstra 2018), met the inclusion criteria, 15 of which were new trials identified in the most recent update (Ahern 2019; Bakırcı-Taylor 2019; Carney 2018; Farrow 2019; Hong 2018a; Hong 2018b; Kim 2018; Kobel 2019; Kristiansen 2019; Lanigan 2017; Nekitsing 2019a; Nekitsing 2019b; Owen 2018; Segura-Perez 2017; Zeinstra 2017). We contacted authors of the included trials for any missing outcome data, to permit meta-analysis.

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Figure 1. Study flow diagram

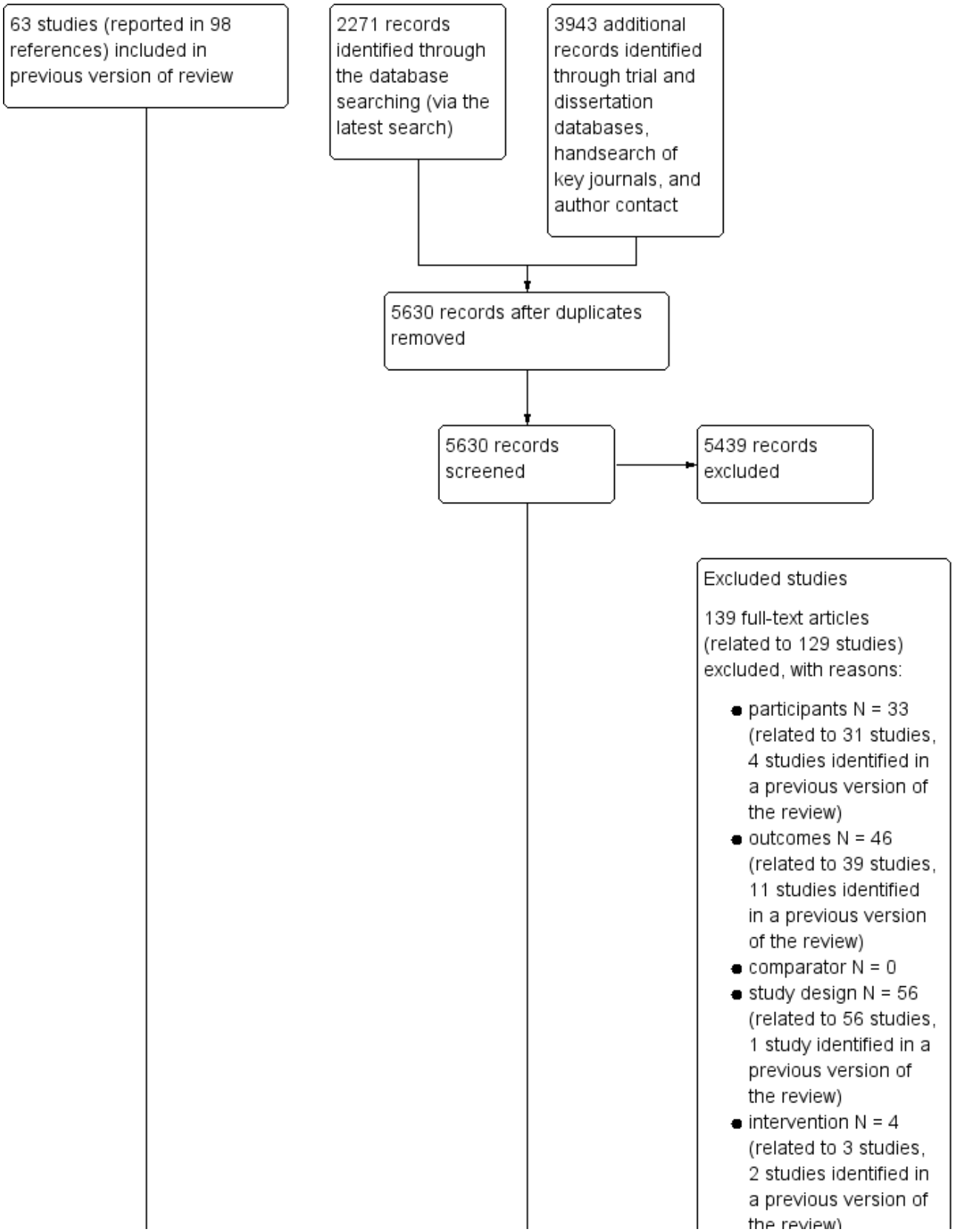

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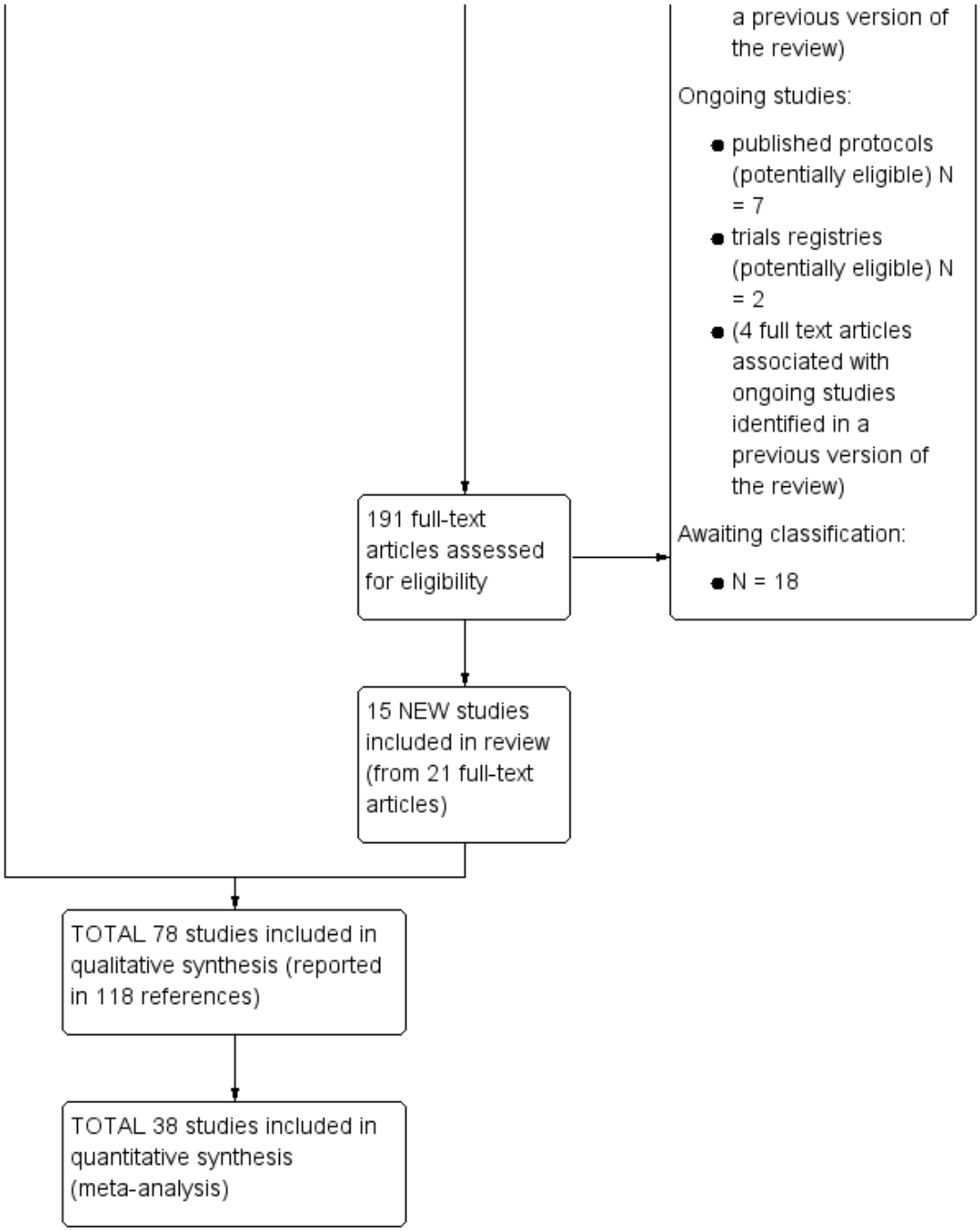
Figure 1. (Continued)



Included studies

There were 214 trial arms and 13,746 participants randomised across the 78 included trials. We give full details of the trials in the Characteristics of included studies table. Thirty-five trials were undertaken in the USA, 14 in the UK, nine in the Netherlands, five in Australia, three in Belgium, two in Germany, and one each in Turkey, Norway, Korea, Denmark, Mexico, France, Spain, Honduras and India, and one trial that was undertaken in the UK, Greece and Portugal. Thirty-seven of the included trials were RCTs, of which 22 compared an intervention to a no-treatment control group; 29 were C-RCTs, of which 25 compared an intervention to a no-treatment control group; and 12 were cross-over trials. The unit of randomisation in C-RCTs included childcare centres or preschools (n = 17), parent groups (n = 2), preschool classrooms (n = 2), kindergartens (n = 2), primary schools (n = 1), primary school classrooms (n = 2), kindergarten classrooms (n = 1), primary care clinics (n = 1) and villages (n = 1).

Thirty-eight trials were conducted in a preschool or school setting; 18 in a home setting; five in a healthcare setting (e.g. primary care); five in a home and laboratory setting; three in a laboratory setting; three in a preschool and home setting; three in a home

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and healthcare setting, one in both a preschool and primary school setting, one in a library and home setting, and one in a community setting. Included trials examined the impact of various types of interventions to increase child fruit and vegetable consumption. Seventy-four of the included trials assessed intake of vegetables, and 36 assessed intake of fruit. Trials used various objective and subjective measures to assess fruit and vegetable intake, such as as-desired intake and mean daily intake as reported by parents. One trial reported information about intervention costs and two trials reported information on any adverse events or unintended adverse consequences of the intervention. Thirteen trials reported information on the reliability and validity of selected fruit and vegetable intake outcome measures in children. Post-intervention follow-up periods ranged from immediate to 3.5 years. Of the 78 included trials, 14 did not report whether funding support was received to undertake the trial, two trials reported no funding support (Baskale 2011; Kim 2018), and the remaining 62 trials reported a source of funding. Funding support for such trials were governmental or charitable, with the exception of four trials that reported receiving funding from food industry sources (Fisher 2012; Gerrish 2001; Sullivan 1994; Tabak 2012).

Child-feeding practice interventions

Forty-eight trials tested the impact of specific child-feeding practice interventions (e.g. repeated exposure) in increasing children's intake of fruit or vegetables (Anzman-Frasca 2012; Ahern 2019; Barends 2013; Blissett 2016; Carney 2018; Caton 2013; Cohen 1995; Cooke 2011; Correia 2014; Cravener 2015; Daniels 2014; de Droog 2014; de Droog 2017; de Wild 2013; de Wild 2015a; de Wild 2015b; de Wild 2017; Farrow 2019; Forestell 2007; Fildes 2014; Fildes 2015; Fisher 2012; Gerrish 2001; Harnack 2012; Hausner 2012; Heath 2014; Hetherington 2015; Keller 2012; Kim 2018; Kling 2016; Lanigan 2017; Mennella 2008; Nekitsing 2019a; Nekitsing 2019b; O'Connell 2012; Owen 2018; Remington 2012; Remy 2013; Roe 2013; Savage 2012; Spill 2010; Spill 2011a; Spill 2011b; Staiano 2016; Sullivan 1994; Wardle 2003a; Zeinstra 2017; Zeinstra 2018). Of the trials testing the impact of specific feeding-practice interventions, 28 compared the effectiveness of two or more interventions and 20 trials compared one or more interventions with a no-treatment control group; 12 of these were cross-over trials.

Eighteen trials examined the effect of repeated exposure compared to an alternate or no intervention. Five compared the effect of a repeated exposure intervention to one or more alternative interventions (including associative conditioning, flavour-flavour learning, flavour-nutrient learning, choice of vegetable versus no choice; Anzman-Frasca 2012; Barends 2013; Caton 2013; Hausner 2012; Remy 2013), one compared the effect of repeated exposure of offering a variety of vegetables to a single vegetable (Ahern 2019); one compared the effect of repeated exposure choice offering of vegetable to no choice (de Wild 2015a), one trial compared the effect of repeated exposures and variety (Mennella 2008), and one trial compared the effect of repeated exposure to a target vegetable using different preparation methods compared to a control vegetable (de Wild 2017), one compared the effect of repeated exposures and food-specific phrases (Lanigan 2017). The other eight trials examined the effect of a repeated exposure intervention compared to no-treatment control, of which two trials examined the effect of repeated exposure alone (Nekitsing 2019b; O'Connell 2012), and one each examined the effect of taste exposure plus rewards (Fildes 2014), exposure plus social reward and exposure plus tangible reward (Remington 2012), exposure and nutrition information (Wardle 2003a), exposure plus tangible reward, exposure plus social reward and exposure alone (Cooke 2011), repeated exposure over six months within early intervention agencies for children with autism spectrum disorder (Kim 2018), and repeated exposure over five months within a childcare setting (Zeinstra 2018).

Two trials examined the effect of flavour nutrient learning, of which one trial compared the effects of low-energy vegetable soup versus high-energy vegetable soup (de Wild 2013), and the other trial compared incorporation of vegetable puree into meals at three different levels of energy density (Spill 2011a). A further trial examined the effect of six different levels of portion size and energy density on vegetable intake (Kling 2016).

Five trials examined the effect of parent-feeding interventions. One trial compared the effects of advice to the parent about introducing vegetables to no-treatment control (Fildes 2015), one trial compared the effects of an early feeding intervention targeting complementary feeding practices to a no-treatment control (Daniels 2014), one trial compared the effects of early and repeated exposure to vegetables during complementary feeding to a no-treatment control (Hetherington 2015), one trial compared parent prompting and modelling, parent prompting alone and modelling alone (Blissett 2016), and the other trial compared exclusive breastfeeding, complementary feeding with breastfeeding, and complementary feeding with breastfeeding on demand (Cohen 1995).

Nine trials examined the effect of pairing fruit and vegetables with positive stimuli. One trial compared pairing vegetables with stimuli such as stickers and cartoon packaging to a no-treatment control (Cravener 2015), one trial compared pairing fruit and vegetables with character branding to a no-treatment control (Keller 2012), one trial compared pairing of vegetables with a modelling DVD to a non-food DVD and a no-DVD control group (Staiano 2016), one trial compared the effects of visual familiarisation (fruit or vegetable story-book) compared to a control group (Owen 2018), one trial compared pairing vegetables with a vegetable maths game (app) to a non-vegetable focused maths game (app; Farrow 2019), one trial compared the effect of pairing passive and interactive story-telling (about a character that eats carrots) featuring either a product-congruent (a rabbit) or product-incongruent (a turtle) character across four experimental groups compared to a control group (de Droog 2014), one trial compared the effect of pairing story telling and sensory play featuring a congruent food (celeriac) or incongruent food (carrot) across four experimental groups (Nekitsing 2019a), and one trial compared the effects of passive and interactive story-telling (about a rabbit that eats carrots) with or without the use of a hand puppet (de Droog 2017). The ninth trial compared pairing carrots with a convivial eating condition (modelling DVD) to a positive restriction group plus convivial eating condition (modelling DVD without carrot consumption followed by modelling DVD with carrot consumption) and a no-DVD control group (Zeinstra 2017).

Four trials examined the effect of pairing target vegetables with liked foods (Correia 2014; de Wild 2015b; Fisher 2012; Forestell 2007). Two trials examined the effect of varying serving sizes (Savage 2012; Spill 2011b). One trial examined the effects of dietary experience (salted or unsalted vegetables; Sullivan 1994). One trial examined the effect of variety of herbs and spice on vegetable consumption (variety or no variety; Carney 2018). The remaining

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three trials examined the effect of different serving methods; one trial compared serving fruit and vegetables first before other menu items to a specific plate of prepared food (Harnack 2012), one trial compared three different portion sizes of vegetables served at the beginning of a meal to a control meal (Spill 2010), and the third trial of eight arms compared the impact of a single type of vegetable, a variety of vegetables, a single type of fruit, and a variety of fruits on consumption (Roe 2013). One trial compared the effect of repeated exposure to pureed green beans alone to pureed green beans and peaches on green bean consumption (Forestell 2007).

One trial examined the effect of introducing a variety of flavours when introducing vegetables, which compared exposure to target vegetable (carrot), an alternate vegetable (potato), and a variety of vegetables that did not include the target vegetable (Gerrish 2001). One trial compared exposure to a picture book of a liked, disliked and unfamiliar vegetable on vegetable consumption (Heath 2014).

Parent nutrition education interventions

Fifteen trials tested the impact of parent nutrition education interventions in increasing children's intake of fruit or vegetables (Bakırcı-Taylor 2019; Black 2011; Campbell 2013; Duncanson 2013; Haire-Joshu 2008; Hunsaker 2017; Martinez-Andrade 2014; Roset-Salla 2016; Sherwood 2015; Skouteris 2015; Tabak 2012; Vazir 2013; Verbestel 2014; Watt 2009; Wyse 2012). Four trials were conducted in a healthcare setting: one trial compared a parenting practices intervention to a maternal diet and physical activity intervention to control (Black 2011), one trial compared a dietitian-delivered intervention in a first-time parents' group regarding infant feeding, physical activity and sedentary behaviours to control (Campbell 2013), one trial compared a six-week parent intervention on obesity awareness and prevention to control (Martinez-Andrade 2014), and the fourth trial compared a multistrategy parent intervention including health snack exposure to control (Skouteris 2015). Five trials were conducted within a home setting: one trial compared the provision of an interactive nutrition education CD and parenting DVD to parents to wait-list control (Duncanson 2013), one trial compared a parent intervention inclusive of a tailored newsletter, home visits and materials to usual care (Haire-Joshu 2008), one trial compared a dietitian-delivered parent intervention on vegetable availability, picky eating, modelling and family meals to control (Tabak 2012); one trial compared a parent health report on fruit and vegetable consumption compared to control (Hunsaker 2017), and the fifth compared a parent intervention on infant-feeding practices to usual care (Watt 2009). Two trials were conducted in a preschool setting; one trial compared a parent education intervention on dietary knowledge and changing habits to control (Roset-Salla 2016), and one trial compared a parent intervention including a poster with guidelines and tips, and tailored feedback about child dietary behaviours versus control (Verbestel 2014). One trial, predominantly conducted in a home setting, compared a parent intervention including a resource kit and telephone calls to improve parent knowledge and skills about the home food environment versus control (Wyse 2012). One trial conducted in both a home and health setting compared a parent complementary feeding intervention to parent complementary feeding and home visit intervention to control (Vazir 2013). One trial compared a paediatrician counselling and home-based programme delivered to parents of children at risk of obesity compared to a safety and injury prevention control (Sherwood 2015). One trial compared a mHealth nutrition intervention for parents inclusive of a mobile website, social media and text messages compared to control (text messages only regarding physical activity; Bakırcı-Taylor 2019).

Multicomponent interventions

Fourteen trials tested the impact of multicomponent interventions (e.g. teacher and parent education, preschool policy changes) in increasing children's intake of fruit or vegetables (De Bock 2012; De Coen 2012; Hong 2018b; Kobel 2019; Kristiansen 2019; Namenek Brouwer 2013; Natale 2014a; Nekitsing 2019b; Nicklas 2017; Segura-Perez 2017; Smith 2017; Vereecken 2009; Williams 2014; Witt 2012). Five trials were conducted in a preschool setting; one trial compared an intervention combining familiarisation, preparation and cooking of meals with children, teachers and parents and parent education regarding modelling and nutrition needs of children to control (De Bock 2012); one trial compared a garden-based intervention and curriculum materials about targeted fruits or vegetables to control (Namenek Brouwer 2013); one trial compared a teacher curriculum, parent curriculum, and preschool policy intervention to control (Natale 2014a); one trial compared a nutrition education intervention targeting children, parents and preschool staff to control (Williams 2014); and the fifth compared a taste exposure and nutrition education intervention to control (Nekitsing 2019b). Two trials were conducted in a school setting; one trial compared a community, school and parent intervention for nutrition and physical activity health targets to control (De Coen 2012); and the other trial compared a preschool environment, child, parent and teacher intervention to control (Vereecken 2009). One trial, conducted in both a school and a home setting, compared an interactive education intervention about physical activity and healthful eating inclusive of teacher guides and parent newsletters to control (Witt 2012). An additional trial, conducted in both a preschool and a home setting, compared a motivational theatre intervention, which included the screening of four DVDs of a puppet show aimed at persuading children to increase vegetable consumption, and provision of resources to parents including ingredients for a vegetable snack, to a no-intervention control (Nicklas 2017). One trial conducted in both a preschool and home setting compared provision of fruit and vegetables for consumption at home to a parent and child nutrition education with fruit and vegetable provision and a no-intervention control (Smith 2017). One trial conducted in a home setting, compared a family nutrition intervention for parents and children and a no-intervention control (Hong 2018b). One trial conducted in a kindergarten setting, compared a teacher-centred health promotion programme targeting nutrition, physical activity and screen time to a no-intervention control (Kobel 2019). One trial conducted in a home and kindergarten setting, compared a multicomponent intervention (including resources and training for staff and parents) to a no-intervention control (Kristiansen 2019). The last trial, which was conducted in a community setting, compared a nutrition education programme with incentives and marketing text messages to a text message-only control group (Segura-Perez 2017).

Child nutrition education interventions

Two trials tested the impact of an intervention involving the delivery of nutrition education to children; both trials compared a nutrition intervention to control with one in nursery classrooms (Baskale 2011), and the other in preschools (Nekitsing 2019b). One trial conducted in schools tested the impact of a mindfulness intervention compared to control (Hong 2018a).

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Excluded studies

Following an assessment of trial titles and abstracts for the update, we sought the full texts of 191 records for further review for trial eligibility (929 in total, when combined with 738 from previous reviews; Figure 1). We were able to locate the full texts of 164 articles (872 in total, when combined with 708 from previous reviews). We considered 139 records from 129 trials (733 records from 618 trials in total) to be ineligible in this review update following the trial screening process (reasons for exclusion of records included participants n = 33; outcomes n = 46; comparator n = 0; trial design n = 56; intervention n = 4). See Characteristics of excluded studies for further details.

Studies awaiting classification

We identified 19 new trials that we were unable to classify (one trial with no full text available was identified in a previous review). See Characteristics of studies awaiting classification.

Ongoing studies

We identified 16 ongoing trials with a published protocol (Characteristics of ongoing studies), for which neither published nor unpublished data were available (nine from the previous reviews and eight new ongoing trials). These include: a C-RCT testing the effect of a multicomponent intervention involving community partnerships and healthy eating training for staff in early childcare centres compared to a no-intervention control (Belanger 2016); a RCT testing the effect of a child-feeding intervention focused on maternal self-efficacy during feeding and appropriate feeding styles compared to usual care (Horodynski 2011); a C-RCT testing the effect of a multicomponent home and childcare intervention compared to a no-intervention control (Østbye 2015); a RCT testing the effect of a multicomponent healthy lifestyle programme delivered to parent-child dyads compared to a wait list or a no-intervention control (Sobko 2016); a RCT testing the effect of a multicomponent intervention involving parents and childcare staff compared to a no-intervention control (Watt 2014); a RCT testing the effect of an eHealth intervention delivered to parents to promote healthy food habits to a no-intervention control (Helle 2017); a RCT testing the effect of a community-based and cost-offset community-supported agricultural intervention to a no-intervention control (Seguin 2017); a factorial RCT testing the effect of 65 differing levels of support for family meals delivered to families recruited from disadvantaged preschools to a no-intervention control (Brophy-Herb 2017); a C-RCT testing the effect of a multicomponent intervention (including social marketing, child healthy eating and physical activity education, and home components) delivered to preschool teachers and parents to a wait-list control (Hennink-Kaminski 2017); a RCT testing the efficacy of a multicomponent family-based intervention (incorporating a dialogue approach to adult learning and self-determination theory) delivered to parent-child dyads to a no-intervention control (Hughes 2016a); a C-RCT cross-over trial testing the effect of a garden-based early care and education center intervention to an attention control (Lee 2018a); a RCT testing customised health promotion intervention (Iran Healthy Start) delivered to educators, children, and parents to usual care (Mehdizadeh 2018); a C-RCT testing the effect of improving nutrition and physical activity environments of family child care homes to an attention control (Risica 2019); a RCT testing the effect of a home-visiting programme (Family Spirit Nurture) delivered to parents to an attentional control (Ingalls 2019); a RCT testing the effect of a repeated-exposure intervention to an infant feeding-schedule intervention to a repeated-exposure and infant-feeding intervention to attention-control (Van der Veek 2019); and a C-RCT testing the effect of a warm lunch with a variety of vegetables to a sensory lesson, meal practice and feeding-style intervention to a no-intervention control (Blomkvist 2018).

We identified a further four new ongoing trials in trials registries (two from the previous review and two new ongoing trials), however no published protocol, nor published or unpublished data were available (Characteristics of ongoing studies). These include a RCT testing the effect of a parental-cooking intervention to a no-intervention control (ISRCTN45864056); a factorial RCT testing the effect of five interventions to increase complementary feeding behaviour by mothers to a no-intervention control (NCT03229629); a C-RCT testing the effect of vegetable juice on children's vegetable consumption to a no-intervention control (UMIN000033818); a RCT testing the effect of an intervention targeting healthy introduction of complementary foods delivered to parents to a no-intervention control (NCT03597061).

Risk of bias in included studies

None of the 78 included trials were at low risk in all 'Risk of bias' domains (Figure 2; Figure 3).

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Figure 2. Risk of bias graph: review authors' judgements about each risk of bias item presented as percentages across all included studies

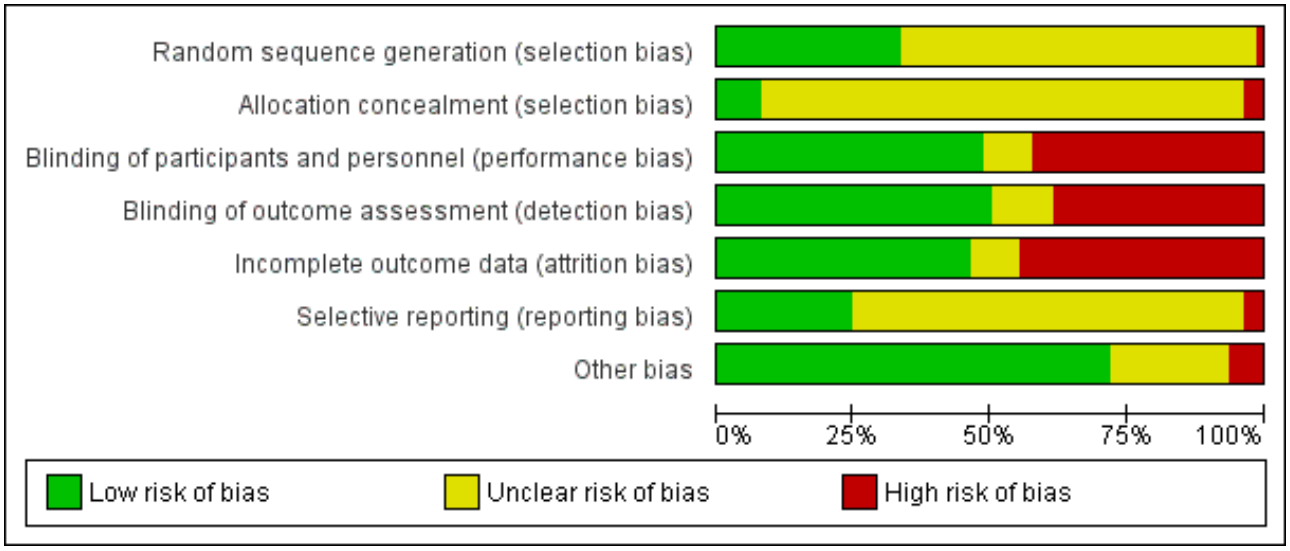

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Figure 3. Risk of bias summary: review authors' judgements about each risk of bias item for each included study

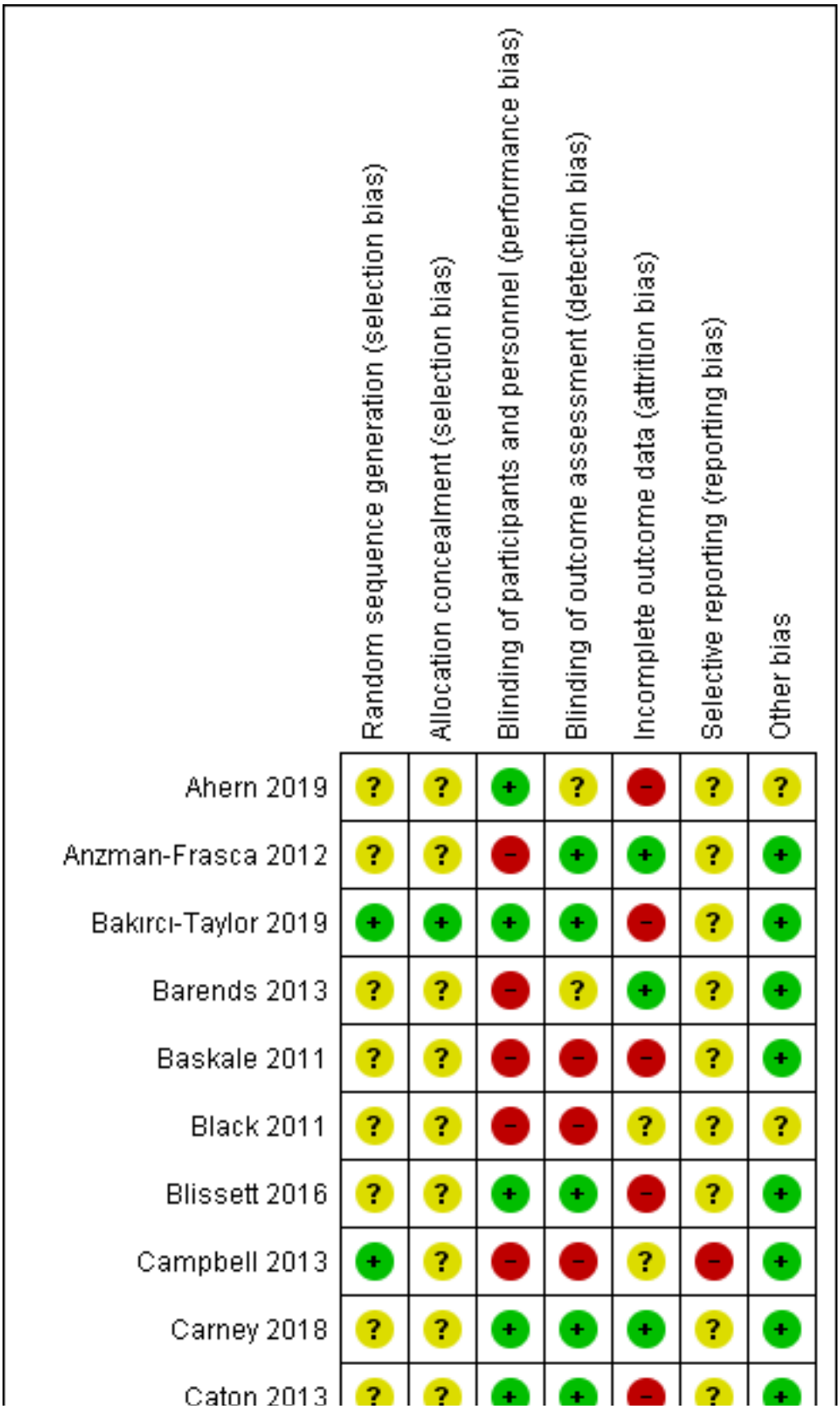

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Figure 3. (Continued)

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Figure 3. (Continued)

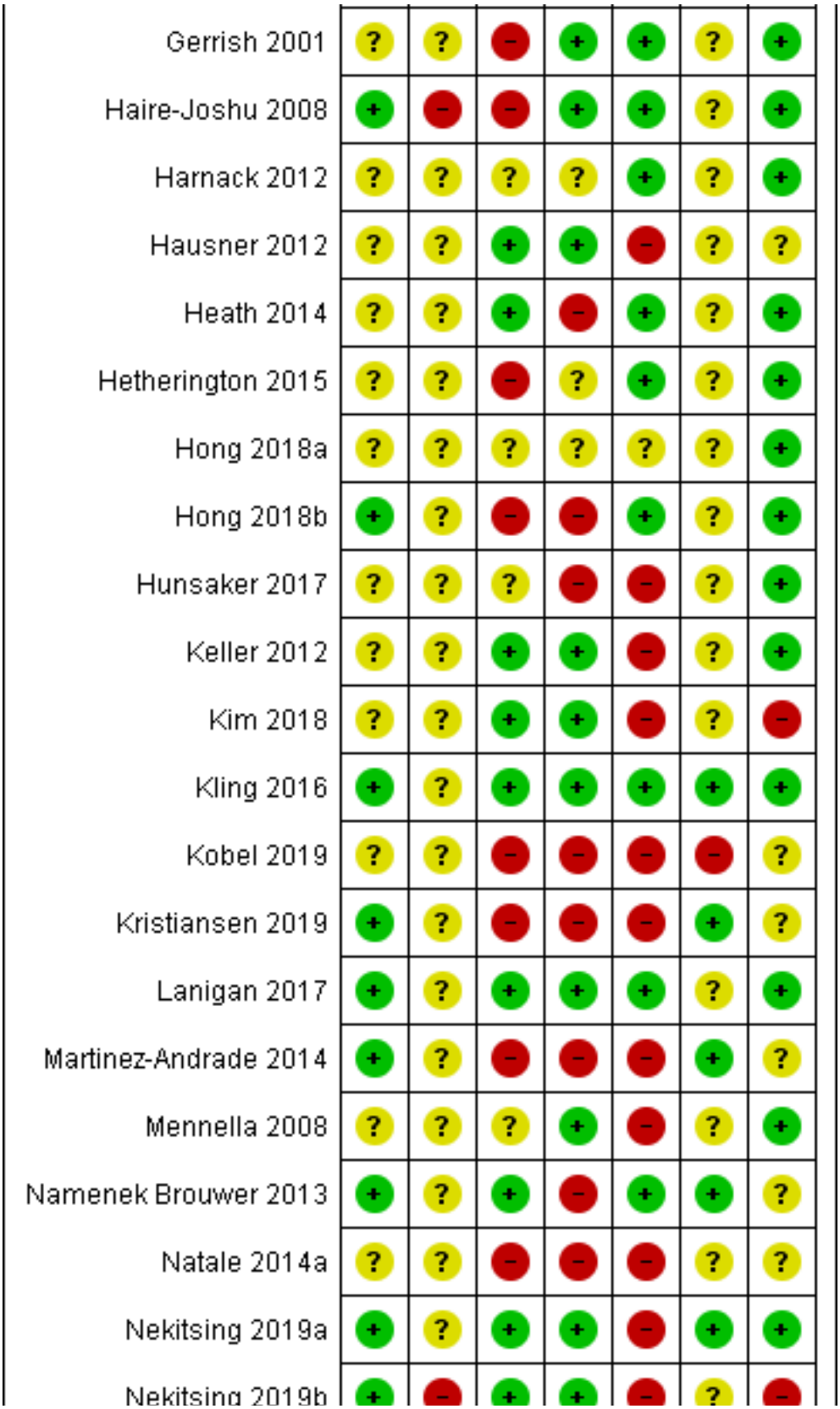

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Figure 3. (Continued)

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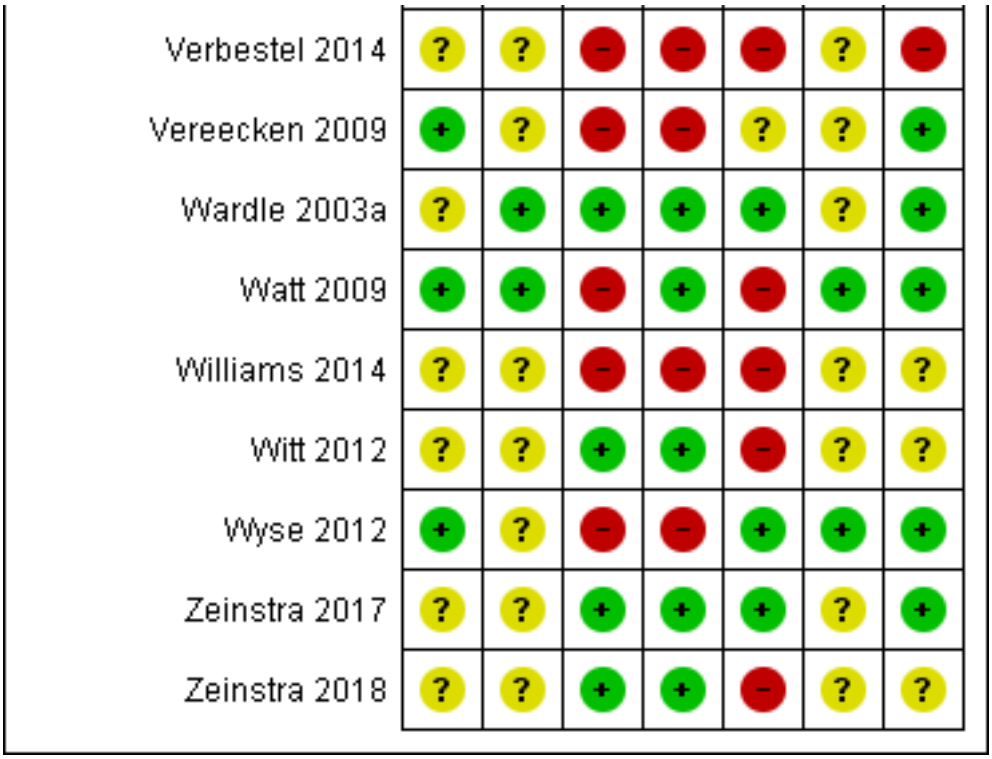
Figure 3. (Continued)



Random sequence generation

We rated 26 of the 78 trials at low risk of bias for random sequence generation, with all random-number sequences created using various computer-based software (Bakırcı-Taylor 2019; Campbell 2013; Cooke 2011; Cravener 2015; Daniels 2014; Duncanson 2013; Fildes 2015; Haire-Joshu 2008; Hong 2018b; Kling 2016; Kristiansen 2019; Lanigan 2017; Martinez-Andrade 2014; Namenek Brouwer 2013; Nekitsing 2019a; Nekitsing 2019b; Roe 2013; Skouteris 2015; Spill 2010; Spill 2011a; Spill 2011b; Staiano 2016; Vazir 2013; Vereecken 2009; Watt 2009; Wyse 2012). We rated one trial (Cohen 1995), at high risk of bias for random sequence generation due to allocation being conducted according to infant's week of birth. The method of sequence generation in the remaining 51 trials was unclear (Ahern 2019; Anzman-Frasca 2012; Barends 2013; Baskale 2011; Black 2011; Blissett 2016; Carney 2018; Caton 2013; Correia 2014; De Bock 2012; De Coen 2012; de Droog 2014; de Droog 2017; de Wild 2013; de Wild 2015a; de Wild 2015b; de Wild 2017; Farrow 2019; Fildes 2014; Fisher 2012; Forestell 2007; Gerrish 2001; Harnack 2012; Hausner 2012; Heath 2014; Hetherington 2015; Hong 2018a; Hunsaker 2017; Keller 2012; Kim 2018; Kobel 2019; Mennella 2008; Natale 2014a; Nicklas 2017; O'Connell 2012; Owen 2018; Remington 2012; Remy 2013; Roset-Salla 2016; Savage 2012; Segura-Perez 2017; Sherwood 2015; Smith 2017; Sullivan 1994; Tabak 2012; Verbestel 2014; Wardle 2003a; Williams 2014; Witt 2012; Zeinstra 2017; Zeinstra 2018).

Allocation

Only six of the 78 trials reported that participant allocation to the experimental group was concealed (low risk of bias) from those conducting the research (Bakırcı-Taylor 2019; De Bock 2012; Duncanson 2013; Remington 2012; Wardle 2003a; Watt 2009). We judged three trials to have a high risk of selection bias (de Droog 2017; Haire-Joshu 2008; Nekitsing 2019b). The remaining 69 trials had an unclear risk of selection bias (Ahern 2019; Anzman-Frasca 2012; Barends 2013; Baskale 2011; Black 2011; Blissett 2016; Campbell 2013; Carney 2018; Caton 2013; Cohen 1995; Cooke 2011; Correia 2014; Cravener 2015; Daniels 2014; De Coen 2012; de Droog 2014; de Wild 2013; de Wild 2015a; de Wild 2015b; de Wild 2017; Farrow 2019; Fildes 2014; Fildes 2015; Fisher 2012; Forestell 2007; Gerrish 2001; Harnack 2012; Hausner 2012; Heath 2014; Hetherington 2015; Hong 2018a; Hong 2018b; Hunsaker 2017; Keller 2012; Kling 2016; Kim 2018; Kobel 2019; Kristiansen 2019; Lanigan 2017; Martinez-Andrade 2014; Mennella 2008; Namenek Brouwer 2013; Natale 2014a; Nekitsing 2019a; Nicklas 2017; O'Connell 2012; Owen 2018; Remy 2013; Roe 2013; Roset-Salla 2016; Savage 2012; Segura-Perez 2017; Sherwood 2015; Skouteris 2015; Smith 2017; Spill 2010; Spill 2011a; Spill 2011b; Staiano 2016; Sullivan 1994; Tabak 2012; Vazir 2013; Verbestel 2014; Vereecken 2009; Williams 2014; Witt 2012; Wyse 2012; Zeinstra 2017; Zeinstra 2018).

Blinding

Performance bias

In 33 of the trials, we judged the potential for trial outcomes to be influenced by participants or personnel delivering the intervention to be high, due to the lack of blinding and the method used for outcome assessment (e.g. self-report) (Anzman-Frasca 2012; Barends 2013; Baskale 2011; Black 2011; Campbell 2013; Cohen 1995; Daniels 2014; De Bock 2012; De Coen 2012; de Wild 2017; Fildes 2014; Fildes 2015; Gerrish 2001; Haire-Joshu 2008; Hetherington 2015; Hong 2018b; Kobel 2019; Kristiansen 2019; Martinez-Andrade 2014; Natale 2014a; Owen 2018; Roset-Salla 2016; Segura-Perez 2017; Sherwood 2015; Skouteris 2015; Smith 2017; Tabak 2012; Vazir 2013; Verbestel 2014; Vereecken 2009; Watt 2009; Williams 2014; Wyse 2012). We rated 38 trials at

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low risk of performance bias, due to blinding or the use of objective outcome assessments, which were unlikely to be influenced by awareness of group allocation (e.g. weighing food on electronic scales) (Ahern 2019; Bakırcı-Taylor 2019; Blissett 2016; Carney 2018; Caton 2013; Cooke 2011; Correia 2014; Cravener 2015; de Droog 2014; de Droog 2017; de Wild 2013; de Wild 2015a; de Wild 2015b; Duncanson 2013; Farrow 2019; Fisher 2012; Hausner 2012; Heath 2014; Keller 2012; Kim 2018; Kling 2016; Lanigan 2017; Namenek Brouwer 2013; Nekitsing 2019a; Nekitsing 2019b; O'Connell 2012; Remington 2012; Remy 2013; Roe 2013; Savage 2012; Spill 2010; Spill 2011a; Spill 2011b; Sullivan 1994; Wardle 2003a; Witt 2012; Zeinstra 2017; Zeinstra 2018). For the seven remaining trials the risk of performance bias was unclear (Forestell 2007; Harnack 2012; Hong 2018a; Hunsaker 2017; Mennella 2008; Nicklas 2017; Staiano 2016).

Detection bias

We rated 30 trials at high risk of detection bias, due to participants or assessors not being blind to group allocation and the use of self-report measures (Baskale 2011; Black 2011; Campbell 2013; Cohen 1995; Daniels 2014; De Bock 2012; De Coen 2012; de Wild 2017; Fildes 2014; Forestell 2007; Heath 2014; Hong 2018b; Hunsaker 2017; Kobel 2019; Kristiansen 2019; Martinez-Andrade 2014; Namenek Brouwer 2013; Natale 2014a; Owen 2018; Roset-Salla 2016; Segura-Perez 2017; Sherwood 2015; Skouteris 2015; Smith 2017; Spill 2010; Tabak 2012; Verbestel 2014; Vereecken 2009; Williams 2014; Wyse 2012). Blinding of assessors, or the objective measurement of child's fruit and vegetable intake, which is unlikely to be impacted by lack of blinding (e.g. the food was weighed or counted), meant that 39 trials had a low risk of detection bias (Anzman-Frasca 2012; Bakırcı-Taylor 2019; Blissett 2016; Carney 2018; Caton 2013; Cooke 2011; Correia 2014; de Droog 2014; de Droog 2017; de Wild 2013; de Wild 2015a; de Wild 2015b; Duncanson 2013; Farrow 2019; Fisher 2012; Gerrish 2001; Haire-Joshu 2008; Hausner 2012; Keller 2012; Kim 2018; Kling 2016; Lanigan 2017; Mennella 2008; Nekitsing 2019a; Nekitsing 2019b; Nicklas 2017; O'Connell 2012; Remy 2013; Remington 2012; Savage 2012; Spill 2011a; Spill 2011b; Sullivan 1994; Vazir 2013; Wardle 2003a; Watt 2009; Witt 2012; Zeinstra 2017; Zeinstra 2018). The remaining nine trials had an unclear risk of detection bias (Ahern 2019; Barends 2013; Cravener 2015; Fildes 2015; Harnack 2012; Hetherington 2015; Hong 2018a; Roe 2013; Staiano 2016).

Incomplete outcome data

Nine trials reported no attrition, and therefore had a very low risk of bias (Anzman-Frasca 2012; Cravener 2015; Farrow 2019; Gerrish 2001; Nicklas 2017; O'Connell 2012; Savage 2012; Spill 2010; Staiano 2016). A further 27 trials reported a low loss of participants (usually less than 10%) and similar losses across arms and we considered them to be at low risk, too (Barends 2013; Carney 2018; Cooke 2011; de Wild 2015a; Fildes 2015; Fisher 2012; Haire-Joshu 2008; Harnack 2012; Heath 2014; Hetherington 2015; Hong 2018b; Kling 2016; Lanigan 2017; Namenek Brouwer 2013; Remington 2012; Roe 2013; Segura-Perez 2017; Sherwood 2015; Skouteris 2015; Smith 2017; Spill 2011b; Sullivan 1994; Tabak 2012; Vazir 2013; Wardle 2003a; Wyse 2012; Zeinstra 2017). Thirty-five trials had a high risk of bias due to high attrition rates, unequal attrition across experimental arms, or an intention-to-treat analysis not being used (Ahern 2019; Baskale 2011; Bakırcı-Taylor 2019; Blissett 2016; Caton 2013; Correia 2014; Daniels 2014; De Bock 2012; De Coen 2012; de Droog 2017; de Wild 2013; de Wild 2015b; Duncanson 2013; Fildes 2014; Forestell 2007; Hausner 2012; Hunsaker 2017; Keller 2012; Kim 2018; Kobel 2019; Kristiansen 2019; Martinez-Andrade 2014; Mennella 2008; Natale 2014a; Nekitsing 2019a; Nekitsing 2019b; Owen 2018; Remy 2013; Roset-Salla 2016; Spill 2011a; Verbestel 2014; Watt 2009; Williams 2014; Witt 2012; Zeinstra 2018). Seven trials had an unclear risk of attrition bias (Black 2011; Campbell 2013; Cohen 1995; de Droog 2014; de Wild 2017; Hong 2018a; Vereecken 2009).

Selective reporting

Most trials had an unclear risk of selective reporting (Ahern 2019; Anzman-Frasca 2012; Bakırcı-Taylor 2019; Barends 2013; Baskale 2011; Black 2011; Blissett 2016; Carney 2018; Caton 2013; Cohen 1995; Cooke 2011; Correia 2014; Cravener 2015; De Bock 2012; De Coen 2012; de Droog 2014; de Wild 2015a; de Wild 2015b; Farrow 2019; Fildes 2014; Fildes 2015; Fisher 2012; Forestell 2007; Gerrish 2001; Haire-Joshu 2008; Harnack 2012; Hausner 2012; Heath 2014; Hetherington 2015; Hong 2018a; Hong 2018b; Hunsaker 2017; Keller 2012; Kim 2018; Lanigan 2017; Mennella 2008; Natale 2014a; Nekitsing 2019b; O'Connell 2012; Owen 2018; Remington 2012; Roset-Salla 2016; Savage 2012; Skouteris 2015; Smith 2017; Staiano 2016; Sullivan 1994; Tabak 2012; Vazir 2013; Verbestel 2014; Vereecken 2009; Wardle 2003a; Williams 2014; Witt 2012; Zeinstra 2017; Zeinstra 2018). We judged three trials (Campbell 2013; Kobel 2019; Segura-Perez 2017) to be at high risk of bias due to outcomes referred to in the protocol not being reported. The remaining 19 trials reported all expected outcomes and we rated them at low risk of bias (Daniels 2014; de Droog 2017; de Wild 2013; de Wild 2017; Duncanson 2013; Kling 2016; Kristiansen 2019; Martinez-Andrade 2014; Namenek Brouwer 2013; Nekitsing 2019a; Nicklas 2017; Remy 2013; Roe 2013; Sherwood 2015; Spill 2010; Spill 2011a; Spill 2011b; Watt 2009; Wyse 2012).

Other potential sources of bias

Of the 37 RCTs, 35 had a low risk of bias (Anzman-Frasca 2012; Bakırcı-Taylor 2019; Barends 2013; Blissett 2016; Caton 2013; Cohen 1995; Cravener 2015; Daniels 2014; de Droog 2014; de Droog 2017; de Wild 2015a; de Wild 2017; Duncanson 2013; Farrow 2019; Fildes 2014; Fildes 2015; Forestell 2007; Gerrish 2001; Heath 2014; Hetherington 2015; Hong 2018a; Hunsaker 2017; Keller 2012; Mennella 2008; Owen 2018; Remy 2013; Remington 2012; Savage 2012; Segura-Perez 2017; Sherwood 2015; Skouteris 2015; Sullivan 1994; Tabak 2012; Wardle 2003a; Watt 2009) and two had an unclear risk of bias (Black 2011; Staiano 2016).

Of the 29 C-RCTs, 10 had a low risk of bias (Baskale 2011; Campbell 2013; Cooke 2011; Haire-Joshu 2008; Hong 2018b; Nekitsing 2019a; Vazir 2013; Vereecken 2009; Wyse 2012; Zeinstra 2017), 15 had unclear risk of bias (Ahern 2019; De Bock 2012; Fisher 2012; Hausner 2012; Kobel 2019; Kristiansen 2019; Martinez-Andrade 2014; Namenek Brouwer 2013; Natale 2014a; Nicklas 2017; Roset-Salla 2016; Smith 2017; Williams 2014; Witt 2012; Zeinstra 2018), and four had high risk of bias (De Coen 2012; Kim 2018; Nekitsing 2019b; Verbestel 2014). Both De Coen 2012 and Verbestel 2014 had high risk of bias due to recruitment bias, as they randomised communities first, before they invited schools, childcare centres and participants to participate. Kim 2018 and Nekitsing 2019b were assessed as high risk of bias due to baseline imbalances.

Of the 12 cross-over trials, 11 had a low risk of bias (Carney 2018; Correia 2014; de Wild 2013; de Wild 2015b; Harnack 2012; Kling 2016; Lanigan 2017; Roe 2013; Spill 2010; Spill 2011a; Spill

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2011b), and one trial had high risk of bias (O'Connell 2012), due to differences in baseline vegetable consumption that were not adjusted for in the analysis.

Effects of interventions

See: **Summary of findings for the main comparison** Child-feeding interventions compared to no intervention for children aged five years and under; **Summary of findings 2** Parent nutrition education interventions compared to no intervention for children aged five years and under; **Summary of findings 3** Multicomponent interventions compared to no intervention for children aged five years and under; **Summary of findings 4** Child nutrition education interventions compared to no intervention for children aged five years and under

Primary outcome. Effectiveness of interventions in increasing the consumption of fruit or vegetables, or both

All the included trials reported the impact of the effectiveness of the intervention on a measure of children's fruit or vegetable intake. Variability in the measurement and reporting of intervention effects as change from baseline or final value scores precluded statistical examination of heterogeneity. Nonetheless, examination of the interventions tested, trial settings and trial populations suggested that the included trials were heterogeneous and we conducted meta-analyses pooling data from trials where we considered interventions to be similar. Otherwise, we have provided a narrative synthesis of trial findings.

Child-feeding practice interventions

Short-term impact (less than 12 months)

The effects of interventions targeting child-feeding practices were mixed. Meta-analysis pooling post-intervention data (follow-up period range: immediate to nine months) from trials comparing child-feeding practices to no treatment (Cohen 1995; Cooke 2011; Cravener 2015; Daniels 2014; Farrow 2019; Fildes 2014; Fildes 2015; Hetherington 2015; Keller 2012; Kim 2018; Nekitsing 2019b; O'Connell 2012; Owen 2018; Remington 2012; Staiano 2016; Wardle 2003a; Zeinstra 2017; Zeinstra 2018) revealed an overall small positive effect on vegetable consumption (SMD 0.42, 95% CI 0.23 to 0.60; I^2 = 68%; 18 trials, 2004 participants; very low-quality evidence; Analysis 1.1), which was equivalent to an increase of 4.45 g as-desired consumption of vegetables. Results were similar in sensitivity analyses of trials at low or unclear risk of bias (SMD 0.30, 95% CI 0.09 to 0.52; I^2 = 28%; 6 trials, 561 participants; Analysis 1.2), of trials with a primary outcome of child fruit or vegetable consumption (SMD 0.50, 95% CI 0.27 to 0.73; I^2 = 72%; 13 trials, 1561 participants; Analysis 1.3), and of trials with no or low attrition and trials with high attrition that undertook intention-to-treat analyses (SMD 0.36, 95% CI 0.18 to 0.54; I^2 = 33%; 11 trials, 951 participants; Analysis 1.4).

One trial that compared one or more child-feeding practice interventions to a no-treatment control did not report sufficient data to enable pooling. Harnack 2012 reported a significant increase in intake of fruit compared to a control group for an intervention where fruit and vegetables were served prior to a meal.

Twenty-nine trials compared the effectiveness of two or more child-feeding interventions but we could not synthesise them in meta-analyses due to variability in the compared interventions (Ahern 2019; Anzman-Frasca 2012; Barends 2013; Blissett 2016; Carney 2018; Caton 2013; Correia 2014; de Droog 2014; de Droog 2017; de Wild 2013; de Wild 2015a; de Wild 2015b; de Wild 2017; Fisher 2012; Forestell 2007; Gerrish 2001; Hausner 2012; Heath 2014; Kling 2016; Lanigan 2017; Mennella 2008; Nekitsing 2019a; Remy 2013; Roe 2013; Savage 2012; Spill 2010; Spill 2011a; Spill 2011b; Sullivan 1994). The interventions compared in these trials varied greatly; 12 of the 30 trials reported evidence of an increase in fruit or vegetable consumption for one intervention compared to another (de Droog 2014; de Droog 2017; de Wild 2013; Forestell 2007; Gerrish 2001; Heath 2014; Lanigan 2017; Nekitsing 2019a; Roe 2013; Spill 2010; Spill 2011a; Spill 2011b).

Long-term impact (12 months or longer)

Two trials tested the long-term effect of a child-feeding practice intervention. One trial reported no long-term effect on either fruit or vegetable intake as measured by 24-hour recall 3½ years after a complementary feeding intervention compared to usual care (Daniels 2014). The other trial (Cohen 1995), which compared exclusive breastfeeding, complementary feeding with breastfeeding, and complementary feeding with breastfeeding on demand reported no difference between groups at 12 months' follow-up compared to the positive effect that was reported at nine months' follow-up.

Parent nutrition education interventions

Short-term impact (less than 12 months)

Interventions targeting parent nutrition education were generally not effective. Meta-analysis pooling post-intervention data (follow-up period range: immediate to six months) from trials comparing parent nutrition education interventions to no treatment (Campbell 2013; Duncanson 2013; Haire-Joshu 2008; Martinez-Andrade 2014; Roset-Salla 2016; Sherwood 2015; Skouteris 2015; Tabak 2012; Verbestel 2014; Watt 2009; Wyse 2012), revealed no overall effect on child consumption of fruit and vegetables (SMD 0.12, 95% CI −0.03 to 0.28; I^2 = 69%; 11 trials, 3078 participants; very low-quality evidence; Analysis 2.1). Results were similar in sensitivity analyses of trials with a primary outcome of children's fruit or vegetable consumption (SMD 0.04, 95% CI −0.08 to 0.16; I^2 = 46%; 8 trials, 2792 participants; Analysis 2.2), and of trials with no or low attrition and trials with high attrition that undertook intention-to-treat analyses (SMD 0.12, 95% CI 0.00 to 0.24; I^2 = 40%; 7 trials, 2518 participants; Analysis 2.3). We did not conduct sensitivity analyses by risk of bias, as we judged all trials to be at high risk of bias in at least one domain.

We were unable to pool four trials in the meta-analysis, which all reported positive intervention effects. Bakırcı-Taylor 2019 reported a positive effect of a mHealth nutrition intervention on child skin carotenoid levels compared to control. Black 2011 found an intervention targeting parent responsivity and behaviour management to be effective in increasing total fruit intake compared to control. Hunsaker 2017 found a parent health report on fruit and vegetable consumption to be effective in increasing total vegetable intake (but not fruit intake) compared to control. Vazir 2013 reported both the parent complementary-feeding intervention and a parent complementary-feeding and home-visit intervention to be effective in increasing both fruit and vegetable intake compared to control.

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Long-term impact (12 months or longer)

Four trials reported the long-term impact of a parent nutrition education intervention (Duncanson 2013; Skouteris 2015; Watt 2009; Wyse 2012). Of these, only one trial reported a significant long-term effect on children's fruit and vegetable consumption (Watt 2009). This trial, which examined the impact of a parent intervention targeting infant-feeding practice found a short-term effect at nine months and long-term effect at 15-month follow-up on fruit and vegetable consumption compared to usual care (Watt 2009). Two other trials reporting long-term impacts of parent interventions either reported a short-term effect that was not sustained at long-term follow-up (Skouteris 2015), or no effect at either short- or long-term follow-up on children's fruit or vegetable consumption (Duncanson 2013). One other trial, reported a short-term effect on child fruit and vegetable intake that was sustained at 12-month but not 18-month follow-up, and reported positive effects on additional measures of child fruit and vegetable intake at 18 months that were not reported for short-term or 12- month follow up (Wyse 2012).

Multicomponent interventions

Short-term impact (less than 12 months)

The effects of multicomponent interventions were mixed. Meta-analysis pooling post-intervention data (follow-up period range: immediate to three months) from multicomponent intervention trials (De Coen 2012; Hong 2018b; Kobel 2019; Kristiansen 2019; Namenek Brouwer 2013; Nekitsing 2019b; Nicklas 2017; Smith 2017; Williams 2014) revealed an overall small positive effect on child consumption of fruit and vegetables (SMD 0.34, 95% CI 0.10 to 0.57; I^2 = 81%; 9 trials, 3022 participants; moderate-quality evidence; Analysis 3.1). This was equivalent to an increase of 0.36 cups of fruit and vegetables per day. Results were similar in sensitivity analyses of trials with a primary outcome of children's fruit or vegetable consumption (SMD 0.38, 95% CI 0.11 to 0.65; I^2 = 83%; 8 trials, 2328 participants; Analysis 3.2) and trials with no or low attrition or high attrition that undertook intention-to-treat analyses (SMD 0.46, 95% CI 0.13 to 0.79; I^2 = 69%; 5 trials, 813 participants; Analysis 3.3). We did not conduct a sensitivity analysis to examine the impact of high risk of bias, as all but one trial had a high risk of bias in at least one domain.

We were unable to pool five trials in meta-analysis, due to insufficient data (De Bock 2012; Natale 2014a; Segura-Perez 2017; Vereecken 2009; Witt 2012). Three trials (De Bock 2012; Natale 2014a; Witt 2012), reported significant effects of the interventions tested on both fruit and vegetable consumption and one trial reported significant effects of the intervention on fruit but not vegetable consumption (Vereecken 2009). A fifth trial reported a significant increase in fruit consumption in the intervention but not control group, with no between-group comparisons reported (Segura-Perez 2017).

One of the trials (Smith 2017), that was pooled in the multicomponent intervention meta-analysis additionally compared an intervention of provision of fruit and vegetables to a no-intervention control group. The trial reported a significant effect of the intervention on vegetable consumption.

Long-term impact (12 months or longer)

No trials testing the multicomponent interventions reported long-term impact.

Child nutrition education interventions

Short-term impact (less than 12 months)

We were unable to pool the two trials that tested child nutrition interventions in meta-analysis (low-quality evidence). One trial that tested the effect of a nutrition education intervention targeting children reported an increase in some of the fruits and vegetables assessed in the intervention group and no significant differences in the control group, but did not report analyses comparing treatment groups (Baskale 2011). The other trial reported a positive effect of a child nutrition education intervention compared to control on vegetable intake (Nekitsing 2019b).

Long-term impact (12 months or longer)

Neither trial that tested the effect of a nutrition education intervention reported long-term impact.

Other child-focused interventions

One trial reported a positive effect of a mindfulness intervention delivered to children to increase child eating enjoyment and diverse eating behaviours on vegetable intake compared to control (Hong 2018a).

Long-term impact (12 months or longer)

The only other child-focused trial did not report long-term impact.

Subgroup analyses

Interventions targeting boys and girls

All the included trials in this review covered both boys and girls. None of the included trials reported the impact of intervention on gender subgroups, so subgroup analyses on this basis was not possible.

Interventions targeting minority groups and indigenous populations

Subgroup analysis of trials that targeted minority groups and indigenous populations was not possible, due to the limited number of included trials for each comparison; we therefore present them narratively. Nine of the 78 included trials examined the impact of interventions on predominantly disadvantaged populations (Black 2011; Cohen 1995; Cooke 2011; de Droog 2017; Haire-Joshu 2008; Natale 2014a; Nicklas 2017; Smith 2017; Watt 2009). Three trials of child-feeding interventions recruited predominantly disadvantaged populations (Cohen 1995; Cooke 2011; de Droog 2017). One trial recruited participants from low-income neighbourhoods (Cohen 1995) and found that a complementary feeding with breastfeeding on demand intervention increased the consumption of vegetables compared to exclusive breastfeeding at short-term follow-up (nine months), but found no effect at long-term follow-up (12 months). One trial recruited participants through schools, where the proportion of children who had English as a second language, came from minority ethnic backgrounds or were eligible for free school meals was above average (Cooke 2011). This trial demonstrated that repeated food exposure coupled with reward significantly increased the consumption of a target vegetable. The third trial recruited participants predominantly from low socioeconomic status households (de Droog 2017). The trial found an interactive-reading intervention significantly increased the consumption of a target vegetable. Three trials of parent interventions

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recruited participants from disadvantaged communities including underserved families, single or minority parent homes, those living in poverty or low-income families (Black 2011; Haire-Joshu 2008; Watt 2009). Two trials found no improvement in overall child fruit or vegetable intake based on the primary trial outcome measures (Haire-Joshu 2008; Watt 2009); the other trial found the intervention targeting parent responsivity and behaviour management to be effective in increasing total fruit intake (Black 2011). Three trials of multicomponent interventions recruited participants from subsidised childcare centres (Natale 2014a; Nicklas 2017; Smith 2017). One trial found an intervention targeting teachers, parents and childcare policies to increase both fruit and vegetable consumption (Natale 2014a), one trial found a theatre performance intervention involving both parents and teachers increased vegetable consumption (Nicklas 2017), and the other trial found both a fruit and vegetable provision intervention and an intervention involving parent and child nutrition education plus fruit and vegetable provision increased fruit and vegetable consumption (as assessed via skin carotenoid levels compared to a no-intervention control (Smith 2017).

Interventions delivered in various settings

Subgroup analyses of child-feeding practice interventions by setting comparing school or preschool, home, home and laboratory, and other settings (one each in child health clinics, and home or health facilities) suggested no differences in effect by setting (test for subgroup differences: $Chi^2 = 2.37$, df = 3 (P = 0.50), $I^2 = 0\%$; Analysis 1.6).

Subgroup analyses of parent nutrition education interventions by setting comparing home, preschool and other settings (one each in parenting groups, primary care clinics or community health centres) suggested no difference between group (test for subgroup differences: $Chi^2 = 1.02$, df = 2 (P = 0.60), $I^2 = 0\%$; Analysis 2.5) suggested no difference in effect by setting.

Subgroup analyses of multicomponent interventions comparing school or preschool, preschool and home, and other settings (one each in clinic and home setting, kindergarten, or home and kindergarten) suggested there was a differential intervention effect by setting (test for subgroup differences: $Chi^2 = 8.71$, df = 2 (P = 0.01), $I^2 = 77.0\%$; Analysis 3.5). Examination within the subgroups revealed an overall positive effect for those interventions delivered in preschool and home settings (SMD 0.66, 95% CI 0.43 to 0.89; 2 trials, 462 participants), but no effect for interventions delivered in school or preschool settings (SMD 0.21, 95% CI −0.07 to 0.49; 5 trials, 2221 participants).

Interventions of varying intensities

We did not conduct subgroup analyses of trials based on interventions of varying intensities, due to the limited information across included trials about the number and duration of intervention contacts or components.

Interventions delivered in different modalities

Fifty-five of the 78 trials used face-to-face intervention delivery only (Ahern 2019; Anzman-Frasca 2012; Barends 2013; Baskale 2011; Black 2011; Blissett 2016; Carney 2018; Caton 2013; Cohen 1995; Cooke 2011; Correia 2014; Cravener 2015; Daniels 2014; De Bock 2012; de Droog 2014; de Droog 2017; de Wild 2013; de Wild 2015a; de Wild 2015b; de Wild 2017; Fildes 2014; Fisher 2012; Forestell 2007; Gerrish 2001; Harnack 2012; Hausner 2012; Heath 2014; Hetherington 2015; Hong 2018a; Keller 2012; Kim 2018; Kling 2016; Lanigan 2017; Martinez-Andrade 2014; Mennella 2008; Namenek Brouwer 2013; Nekitsing 2019a; Nekitsing 2019b; O'Connell 2012; Remington 2012; Remy 2013; Roe 2013; Roset-Salla 2016; Savage 2012; Skouteris 2015; Spill 2010; Spill 2011a; Spill 2011b; Sullivan 1994; Vazir 2013; Verbestel 2014; Wardle 2003a; Watt 2009; Witt 2012; Zeinstra 2018), reporting mixed findings.

Subgroup analysis of child-feeding practice interventions versus control by modality comparing face-to-face and other modalities (including face-to-face combined with various other modalities, audiovisual only, telephone and mail) suggested no difference in intervention effect by modality (test for subgroup differences: $Chi^2 = 0.01$, df = 1 (P = 0.90), $I^2 = 0\%$; Analysis 1.5).

Subgroup analysis of parent nutrition education interventions versus control by modality comparing face-to-face only, audiovisual only, and other modalities (including face-to-face combined with various other modalities, DVD and CD) suggested no differences in intervention effect by modality (test for subgroup differences: $Chi^2 = 2.39$, df = 2 (P = 0.30), $I^2 = 16.2\%$; Analysis 2.4).

Subgroup analysis of mulitcomponent interventions versus control by modality comparing face-to-face only, face-to-face and written materials, and other modalities (including face-to-face combined with various other modalities) suggested there was a differential intervention effect by setting (test for subgroup differences: $Chi^2 = 7.96$, df = 2 (P = 0.02), $I^2 = 74.9\%$, Analysis 3.4). Examination within subgroups revealed an overall positive intervention effect on fruit and vegetable intake of face-to-face only interventions (SMD 1.06, 95% CI 0.13 to 1.99; 2 trials, 67 participants), whereas there was no overall intervention effect for interventions that combined face-to-face delivery with written materials or other modalities (Analysis 3.4).

Face-to-face intervention delivery alone was used in the two child nutrition education interventions (Baskale 2011; Nekitsing 2019b), and the only other child-focused intervention (Hong 2018a), for which mixed results were reported. Other trials that we could not synthesise in meta-analyses, incorporating other intervention modalities, reported mixed findings.

Secondary outcome 1. Cost or cost effectiveness of interventions to increase the consumption of fruit or vegetables or both

Information about intervention costs was reported in one trial (Campbell 2013; very low-quality evidence). The parent nutrition education trial reported the total estimated cost of delivering a parent intervention for infant feeding, physical activity and sedentary behaviours delivered by a dietitian as approximately AUD 500 per family.

Secondary outcome 2. Adverse effects of interventions to increase the consumption of fruit or vegetables or both

Two trials reported information on any adverse events or unintended adverse consequences of the intervention. One child-feeding practice intervention trial reported no adverse effects on the amount of the meal consumed following implementation of an intervention involving incorporation of vegetable puree into meals at three different levels of energy density (Spill 2011a; very low-

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quality evidence). The other trial, on parent nutrition education, reported no adverse effect on family food expenditure following implementation of a multicomponent intervention delivered over the telephone to improve parental knowledge and skills about the home food environment (Wyse 2012; very low-quality evidence).

DISCUSSION

Summary of main results

In line with the importance of encouraging fruit and vegetable consumption among children in early childhood, this updated review has identified a number of new RCTs of interventions investigating this health behaviour. The findings suggest that child-feeding practice and multicomponent interventions targeting fruit and vegetable consumption by children aged five and younger are effective. Most of the included trials examined specific child-feeding practices; whilst meta-analysis of 18 of the 48 trials suggested these interventions were effective, collectively the findings for these interventions were equivocal. The second and third most common interventions were parent nutrition education and multicomponent interventions, for which we found evidence of effect in the short term in meta-analyses for multicomponent interventions but not parent nutrition interventions. Only two trials assessed the effect of a child nutrition education intervention and one trial assessed the effect of a child-focused mindfulness intervention. Subgroup analyses on the basis of setting and modality suggested no differential effectiveness for child-feeding practices and parent nutrition education interventions. Whereas subgroup analyses of multicomponent interventions revealed a differential effect by both setting and modality. Insufficient evidence was available to determine the long-term effectiveness of all approaches, or the cost effectiveness or any adverse consequences of the interventions tested.

Overall completeness and applicability of evidence

The review update identified a number of newly published RCTs, in line with efforts globally to increase fruit and vegetable intake (World Health Organization 2003). Such trials predominantly focused on fruit and vegetable consumption determinants such as nutrition knowledge and skills, and food environments. Only one of the included trials in this review reported cost analyses and only two reported any unintended adverse effects. These factors are important considerations for health practitioners and policy makers but are often not reported in randomised trials (Waters 2011), or examined in systematic reviews (Hopewell 2008; Wolfenden 2010b).

Furthermore, the limited number of relevant trials identified for inclusion also prevented thorough examination of the impact of the interventions by gender, indigenous or disadvantaged populations, setting, varying intensity and modality. We found a number of trial protocols (see Characteristics of ongoing studies) that may address some of these gaps in the literature, and are likely to be eligible for inclusion in future updates of the review, including a RCT of an eight-lesson in-home intervention in economically and educationally disadvantaged parents of children aged one to three years (Horodynski 2011).

The external validity of the review findings are limited. Most of the trials were conducted in the USA, Western Europe or the UK. Trial attrition varied between trials, ranging from 0% to 68%.

Quality of the evidence

We used the GRADE approach to assess the quality of the evidence for the primary outcome of fruit and vegetable intake, which we conducted separately for each intervention type. See Summary of findings for the main comparison; Summary of findings 2; Summary of findings 3; Summary of findings 4. The quality of the evidence for fruit and vegetable intake across intervention types varied from very low to moderate. We rated the quality of evidence for specific child-feeding interventions as very low, downgraded for unexplained heterogeneity, methodological limitations and a high probability of publication bias (Summary of findings for the main comparison); methodological limitations related to allocation concealment and selective reporting being at unclear or high risk for most of the trials. A high probability of publication bias related to the relatively few trials being included in the meta-analysis (12 of 39 trials) and inspection of funnels plots (Figure 4). We assessed the quality of evidence for parent nutrition education interventions as very low, downgraded for unexplained heterogeneity, methodological limitations and imprecision (Summary of findings 2; Figure 5). The methodological limitations related to most of the trials being at high risk of bias for lack of blinding, and at unclear or high risk for allocation concealment, loss to follow-up, and selective reporting. Imprecision related to the confidence intervals crossing the null value of zero. Such assessments suggest that the true effect may be substantially different from the intervention effects reported in the review, with future research very likely to change the estimate for specific infant feeding and parent nutrition education interventions.

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Figure 4. Funnel plot of comparison 1. Short-term impact (< 12 months) of child-feeding intervention versus no intervention on child consumption of target fruit or vegetable, outcome 1.1, fruit and/or vegetable intake

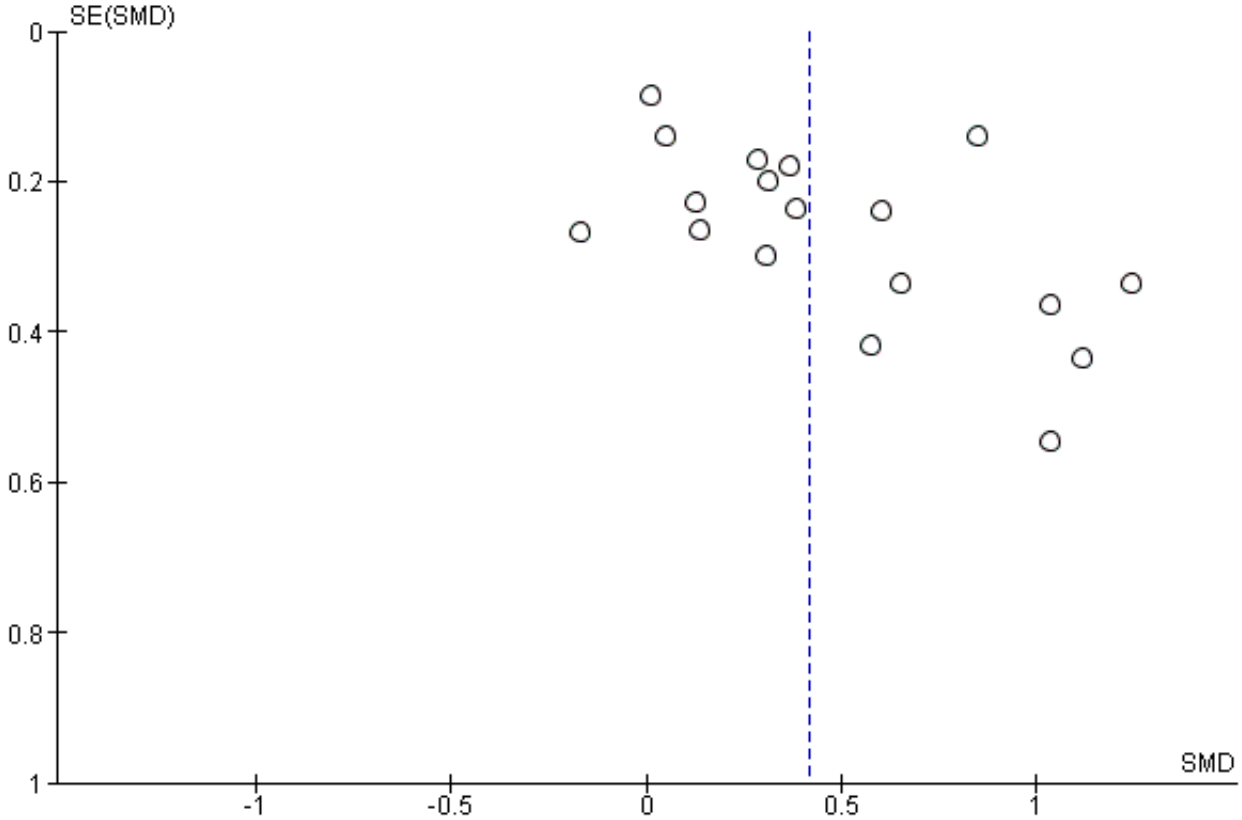

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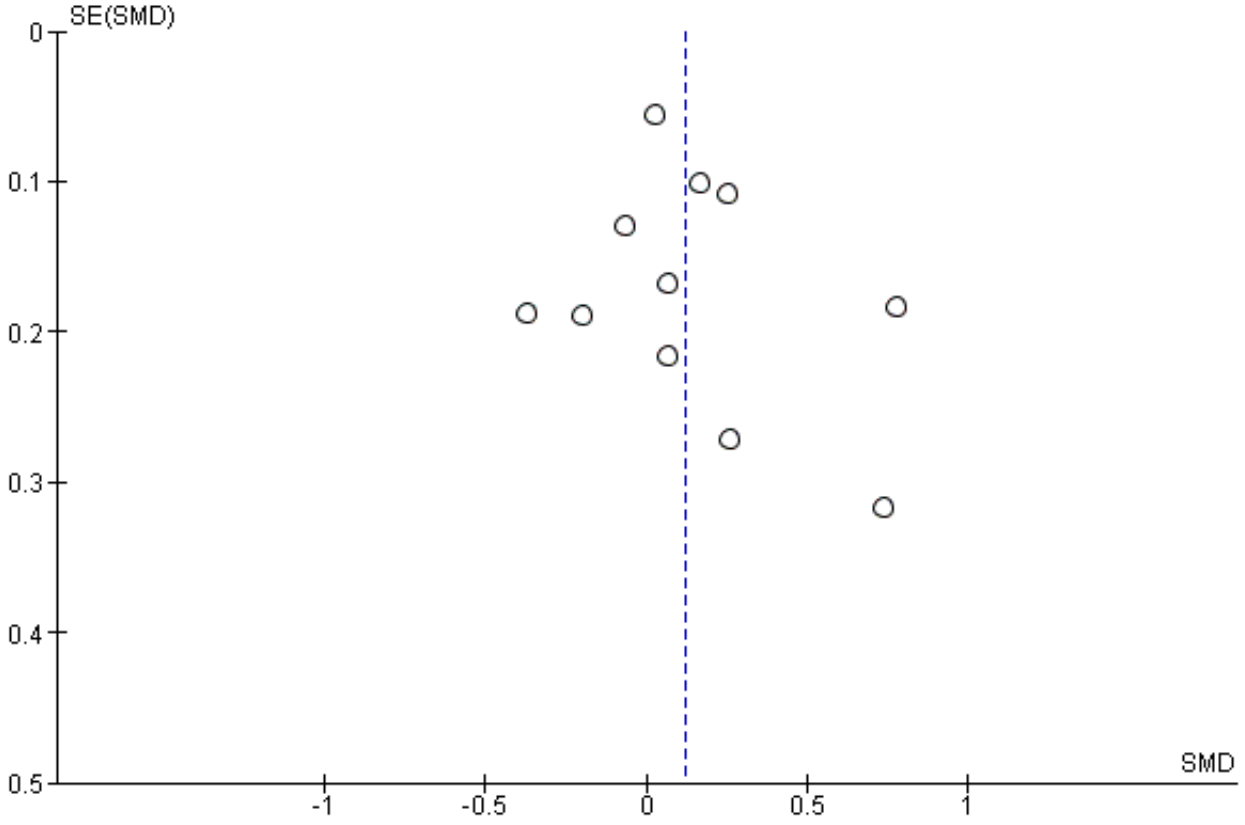
Figure 5. Funnel plot of comparison 3. Short-term impact (< 12 months) of parent nutrition education intervention versus usual care, outcome 3.1, fruit and/or vegetable intake



We rated the quality of evidence for multicomponent interventions as moderate, downgraded for methodological limitations only (Summary of findings 3; Figure 6). The methodological limitations related to most of the trials being at high risk of bias for lack of blinding, and at unclear or high risk for allocation concealment, loss to follow-up, and selective reporting. Such assessment suggests that the true effect is likely to be close to the intervention effects reported in the review, but it is possible that future research may change the estimate for multicomponent interventions.

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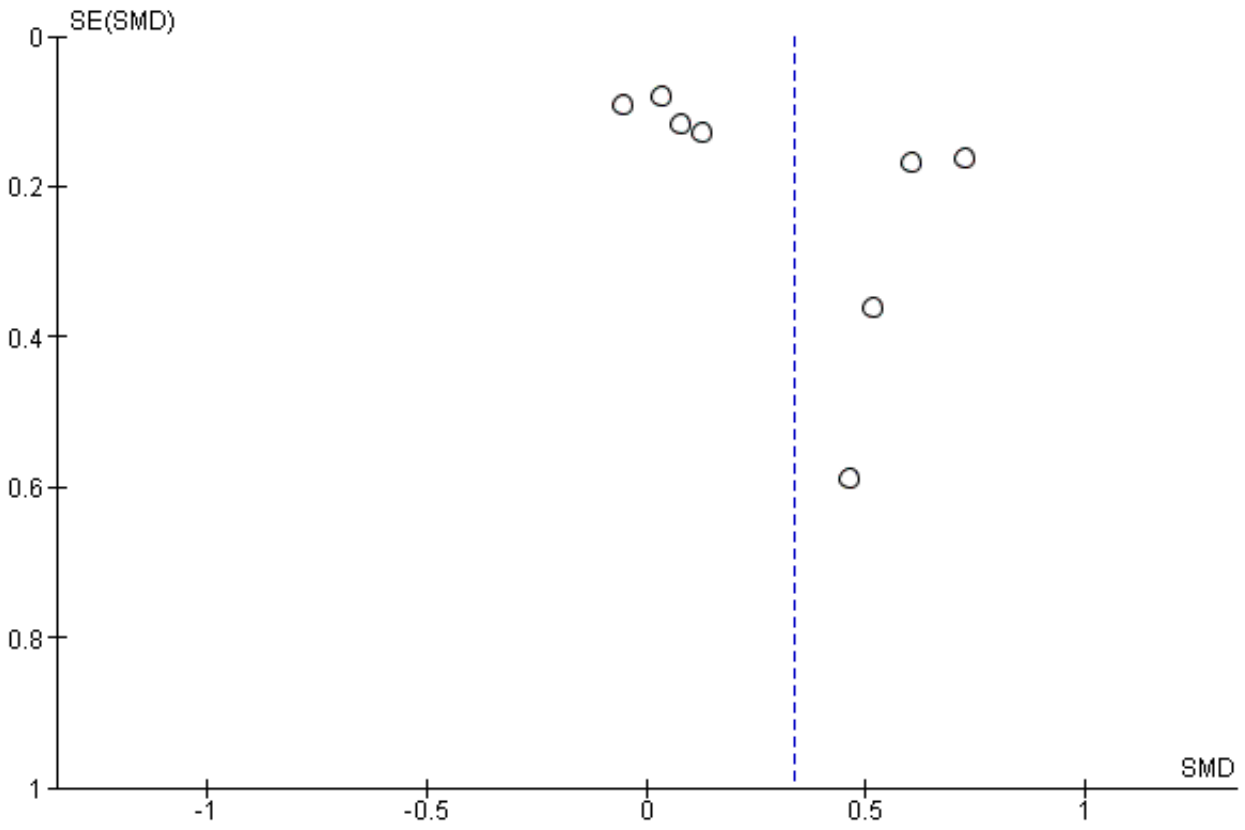
Figure 6. Funnel plot of comparison 4. Short-term impact (< 12 months) of multicomponent intervention versus usual care, outcome 4.1, fruit and/or vegetable intake



We rated the quality of the evidence for child nutrition interventions as low, downgraded for methodological limitations and imprecision (Summary of findings 4). The methodological limitations related to a high risk of bias due to lack of blinding and loss to follow-up, and imprecision related to a sample size of fewer than 400 participants. Future research is likely to change the estimate for child nutrition interventions.

Potential biases in the review process

The review used a comprehensive and rigorous methodology, including a broad search strategy, the screening of trials and extraction of data by two independent review authors, and the appraisal of risks of bias within the included trials. Furthermore, the review did not restrict publications by language. Three aspects of selection bias, however, are worth noting. First, we excluded trials where fruit and vegetable intake was not considered to be a primary trial outcome, to avoid any potential confounding effects of other behavioural interventions (such as physical activity). This restriction may lead to overestimates of intervention effects if in practice they are delivered in the context of other health initiatives. Second, the inclusion of trials that did not explicitly state a primary outcome but did assess fruit or vegetable intake in the review may have biased the results. However sensitivity analyses excluding trials that did not state fruit and vegetable intake as a primary outcome suggested this was limited, as results were similar. Third, trials that were conducted predominantly in disadvantaged populations were included within the overall synthesis. It is possible that effects of the interventions tested may differ between disadvantaged and general populations, which may limit the generalisability of the review findings. Fourth, the mean age of participants of included trials for some intervention types, such as child-feeding practice interventions, was broad (ranging from four months to five years). Whilst, the WHO recommends that solid foods are introduced from six months of age (World Health Organization 2003), the effects of child-feeding interventions in particular may differ by child age and we will consider subgroup analysis to explore this potential differential impact in future review updates. Finally, the review was restricted to RCTs and cross-over trials, with trials included in the review tending to focus on interventions targeting fruit and vegetable consumption determinants, such as nutrition knowledge and skills, or the food environment of settings. Other trials targeting fruit and vegetable intake that may be less amenable to evaluation using randomised controlled designs, such as those requiring macro-environmental changes, may have been overlooked.

Agreements and disagreements with other studies or reviews

The equivocal findings of the infant-feeding interventions, such as repeated food exposure, are similar in part to previous reviews. An early systematic review of healthy eating interventions for children aged under five years (Tedstone 1998), published by the Health Education Authority, concluded that repeated food exposure is effective in enhancing children's willingness to consume novel foods provided tasting was included as a part of the exposure.

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Enhanced food acceptance following repeated food exposure has also been reported in other reviews and controlled trials (Contento 1995). As Cooke 2011 points out in the Background review of research for their randomised trial, evidence about the use of rewards to encourage children's consumption of targeted foods appears more equivocal. The positive impact of both social and non-tangible rewards reported in Cooke 2011, were however consistent with previous trials in community settings using tangible non-food rewards and social rewards targeting the fruit or vegetable intake of school-aged children (Hendy 1999). The large number of trials comparing alternative and heterogenous child-feeding practice interventions are difficult to interpret, given that they did not include a no-treatment control group, and few reported one intervention to be more effective than another.

The largely null findings of this review for the impact of parent interventions are consistent with those reported in previous reviews of dietary interventions. For example, a comprehensive review of the impact of home-visiting programmes delivered to parents concluded that there was little evidence to recommend such interventions as means of improving children's diet, given the mixed findings of the reviewed trials (Elkan 2000). Among the trials with a positive intervention effect included in the Elkan 2000 review was a pre-post trial of an intensive intervention provided to low-income mothers of children aged one to four years (James 1992). In this trial, dietician-trained general practitioners and health visitors provided advice and support as part of a primary-care home-visiting intervention lasting up to 20 weeks. Post-intervention improvements in diet were reported, including the consumption of fruits and vegetables. Similarly, a systematic review that examined the effectiveness of parental interventions on the diets of children aged two to five found mixed results for children's diets or feeding practices or both (Peters 2012).

The positive findings for multicomponent interventions are consistent with some previous reviews of interventions. For example, a systematic review of interventions to improve diet, physical activity or to prevent weight gain for children of five years or under, and which included both randomised and non-randomised designs, identified nine trials of interventions implemented in preschool or childcare settings (Hesketh 2010). Three trials included some assessment of dietary outcome. In the first, Head Start preschools were assigned to either a menu intervention to reduce the fat content of meals provided to children in care; the same menu intervention plus nutrition education; or a third usual-care control condition (Williams 2004). Both intervention arms of the trial reduced the fat content of foods served to children compared with the preschools in the control condition. The remaining two trials assessed the impact of a healthy eating and physical activity obesity-prevention programme 'Hip-Hop to Health Jr', implemented in two different populations attending Head Start preschools (Fitzgibbon 2005; Fitzgibbon 2006). In Fitzgibbon 2005, intervention children reported less saturated fat intake at the one-year follow-up, but not total fat or dietary fibre. No improvements in dietary intake were reported in the second trial (Fitzgibbon 2006). Similarly, systematic reviews of school-based fruit and vegetable interventions have frequently concluded that multicomponent initiatives are the most effective in increasing fruit and vegetable consumption in older children, but such effects are only modest and reported to be driven largely by increased fruit intake (Burchett 2003; Ciliska 2000; French 2003; Knai 2006). A systematic review of European school-based interventions also concluded that multicomponent interventions are effective for improving children's fruit and vegetable intakes (Van Cauwenberghe 2010).

In contrast to the findings of this review, a number of other reviews have found multicomponent interventions to not be effective. A recent meta-analysis showed no significant differences between multicomponent interventions that promoted fruit and vegetable consumption and control conditions in a primary school setting (Delgado-Noguera 2011). Another systematic review that focused on the fruit and vegetable intake of children aged five to 12 found that school-based interventions had only a minimal effect on vegetable consumption, whereas they found a moderate impact on children's fruit intake (Evans 2012). A recent systematic review that examined interventions aimed at increasing children's (aged two to 12 years) vegetable intake in home and community settings found that only a minority of interventions that targeted children's vegetable intake alone were effective in the short term (Hendrie 2017). In contrast, when vegetable intake was addressed as part of a healthy diet or lifestyle intervention, most interventions showed short-term effectiveness (Hendrie 2017). The comparison of the findings of this review to each of these previous reviews of multicomponent interventions is limited by their inclusion of older children, which may explain the contrasting findings.

AUTHORS' CONCLUSIONS

Implications for practice

We found little evidence of effect for interventions to increase the fruit and vegetable consumption of children aged five years and under, to provide direction for health policy makers and practitioners. The effect of parent nutrition education is uncertain. Very low-quality evidence for specific child-feeding interventions (such as repeated exposure and rewards) suggests such interventions may be effective, but such findings should be interpreted with caution, given that we could pool fewer than half of the identified child-feeding intervention trials in meta-analysis, and that no data were reported for important outcomes such as costs and unintended consequences of such interventions. Whilst moderate-quality evidence for multicomponent interventions suggests that such interventions are probably effective, similarly no data were reported for important outcomes such as costs and unintended consequences, which are important considerations when considering implementation. Additionally, the effect size for both child-feeding and multicomponent interventions was small (equivalent to an increase in as-desired vegetable intake of 4.45 g and 0.36 cups of fruit and vegetables consumed per day respectively), which may limit the potential public health benefits of implementing these types of interventions.

Implications for research

Despite the large number of trials, the lack of high-quality research in this area demonstrates the continuing considerable scope for policy makers, researchers and practitioners to develop and evaluate the impact of a variety of initiatives to improve fruit and vegetable intake in children aged five years and under. Behavioural interventions delivered via health professionals, telephone or computer-based programmes, interventions delivered through preschools, play-groups, sports clubs, or co-operatives, and those that address access issues through subsidies or other incentives all have merit, and rigorous evaluation of such interventions for

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children aged five years and under would contribute greatly to the available evidence base to inform practice. In particular, trials should seek to test interventions that are based on logic models of change, appropriate theoretical frameworks and evidence, using high-quality evaluation methods. As the aetiology of child diet is complex, interventions that target multiple determinants across a number of settings may be most likely to be effective. Additionally future trials should rigorously assess and report the cost effectiveness and adverse effects of any tested intervention approaches to ensure that essential evidence is generated for, and accessible to, clinicians and policymakers to aid decision making regarding selection of interventions focused on child fruit and vegetable consumption that are most likely to be of benefit.

This review identified a number of opportunities for future or continued intervention research targeting the fruit and vegetable consumption of children aged five years and under, including:

1. the exploration and development of intervention strategies that can achieve larger effect sizes;
2. the investigation of potential adverse effects of interventions (e.g. increased family grocery costs, or adverse effects on parent self-esteem or sense of competence) as a routine part of intervention trials;
3. examination of the cost effectiveness of interventions found to be effective;
4. interventions with extended periods of follow-up to assess sustainability of intervention effects;
5. interventions delivered using electronic modalities such as the Internet or mobile phones;
6. interventions implemented across a broader range of settings including health services and sports clubs;
7. the investigation of the impact of interventions for children from low-income, minority or indigenous communities (including via subgroup analyses).

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* Indicates the major publication for the study

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CHARACTERISTICS OF STUDIES

Characteristics of included studies *[ordered by study ID]*

Ahern 2019

Methods	**Study design:** Cluster-randomised controlled trial **Funding:** *"Research leading to these results has received funding from the European Community's Seventh Framework Programme (FP7/2007–2013) under the grant agreement n°245012-HabEat; coordinated by Dr Sylvie Issanchou."*
Participants	**Description:** Children aged 24-60 months attending 5 nurseries located in the West and South Yorkshire areas, UK **N (randomised):** 5 nurseries, 184 children **Age:** Child (mean): repeated exposure = 45.6 months, variety = 40.0 months **% Female:** Child: repeated exposure = 45%, variety = 43% **SES and ethnicity:** *"All five nurseries served areas located within the 50% most deprived (small areas) in England according to the Index of Multiple Deprivation scores [https://www.gov.uk/government/collections/english-indices-ofdeprivation]."* *"Children attending two of the nurseries were predominantly White British, while children at the remaining three were predominantly South Asian."* **Inclusion/exclusion criteria:** No explicit inclusion/exclusion criteria stated for this trial, however, children were screened for food allergies (as reported by parents). **Recruitment:** *"Parents of pre-school children aged 24–60 months were recruited through local day care nurseries in the West and South Yorkshire areas, UK."* **Recruitment rate:** Nurseries: 50% (5/10) Children: unknown **Region:** West and South Yorkshire areas (UK)
Interventions	**Number of experimental conditions:** 2 **Number of participants (analysed):** 40 children (not specified by group)

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Ahern 2019 *(Continued)*

Description of intervention:

3 target vegetables were selected for the intervention that were familiar but were not typically eaten as snacks: baby sweet corn, celery, and red pepper.

"The target vegetables were offered as the single snacks (in the RE condition) and included in the mixed vegetable snack (in the V condition). To ensure variety, a further 2 vegetables, radish and green pepper, were also selected to be included in the mixed vegetable snack based on the same criteria (familiar, but were not typically consumed as snacks)."

"The single vegetable snack consisted of 100 g of one of the three target vegetables (baby sweet corn, celery or red pepper). The variety snack was a mix of 20 g of each of the five vegetables (baby sweet corn, celery, red pepper, green pepper and radish)."

Duration:

3 weeks

Number of contacts:

6 exposures (twice/week)

Setting:

Preschool

Modality:

Face-to-face

Interventionist:

Nursery staff (researcher present for first session)

Integrity:

"In total, 115 children received at least 5 of the 6 exposures and were present for all pre-intervention and post-intervention measures."

Date of study:

Unknown

Description of control:

N/A

Outcomes

Outcome relating to children's fruit and vegetable consumption:

Child's consumption of vegetable snacks (grams). Unclear how vegetable snacks weighed and recorded

Outcome relating to absolute costs/cost-effectiveness of interventions:

Not reported

Outcome relating to reported adverse events:

Not reported

Length of follow-up from baseline:

5 and 10 weeks

Length of follow-up post-intervention:

< 1 (2-5 days) and 5 weeks

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Ahern 2019 *(Continued)*

Subgroup analyses:

"In order to identify differences in the age, BMI and gender of the two groups a one way analysis of variance and also chi-square tests were conducted."

"No main effects or interactions involving age or BMI z-scores were found."

Loss to follow-up (at < 1 week and 5 weeks):

Overall = 48%, 78%

Analysis:

Adjusted for clustering

Sample size calculation was performed

Notes

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	"Nursery classes were randomly assigned to a condition (RE or V) and then randomly assigned to a target vegetable (baby corn, red pepper, or celery) using a block approach." No further information
Allocation concealment (selection bias)	Unclear risk	No information provided re concealment
Blinding of participants and personnel (performance bias) All outcomes	Low risk	Outcome group: intake (grams) – no blinding but objective measure of child's vegetable intake and unlikely to be influenced by performance bias
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Outcome group: all/objective measure – unlikely personnel influence intake however unclear if the researcher or nursery staff completed the measurements
Incomplete outcome data (attrition bias) All outcomes	High risk	Loss to follow-up: 69/184 = 38% Same reason, did not receive at least 5 exposures, no ITT reported Not provided by group
Selective reporting (reporting bias)	Unclear risk	Unclear – no protocol or trial registration
Other bias	Unclear risk	Recruitment bias (low risk): randomised after recruitment Baseline imbalance (unclear risk): to control for significant differences in age and BMI z-scores, analyses included these factors as covariates. Age was first recalculated to be mean centred. Loss of clusters (low risk): no evidence of loss of clusters Incorrect analysis (low risk): adjusted for clustering. "In order to investigate whether the nursery conditions produced any clustering, the intra cluster correlation for the pre intervention intake was assessed by calculating a mixed model using lmer in R with only nursery as a random factor. This produced an

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Ahern 2019 *(Continued)*

	ICC of 0.04, VIF=1.72. In order to ensure this did not impact the result, all the main analyses were recalculated using multilevel models with nursery and child as random factors. This produced no change in the pattern of results reported, and for simplicity the simpler ANCOVA results are reported here." Contamination bias (low risk): no contamination bias evident.

Anzman-Frasca 2012

Methods	**Study design:** Randomised controlled trial **Funding:** Not reported
Participants	**Description:** Children aged 3 to 6 years attending an independent childcare facility in Central Pennsylvania, USA **N (Randomised):** 47 children **Age:** 3 to 6 years (mean = 4.7 years) **% Female:** 51% **SES and ethnicity:** Children: White = 83%, Asian = 10% Parents: "Most parents were well-educated (median education = bachelor's degree) and were currently employed. The majority of parents reported being married (88%), and the majority of the families reported annual combined family incomes greater than $60,000 (89%)." **Inclusion/exclusion criteria:** No explicit inclusion criteria stated for this trial Exclusion criteria: "Children were excluded if they had intolerance to study foods, a chronic illness affecting food intake, or if they were non-English speaking. Additionally, individuals with extended absences were excluded from the results." **Recruitment:** Not specified **Recruitment rate:** Unknown **Region:** Central Pennsylvania (USA)
Interventions	**Number of experimental conditions:** 2

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Anzman-Frasca 2012 *(Continued)*

Number of participants (analysed):

41 (not specified by group)

Description of intervention:

"All children in each classroom received the same vegetable throughout the study".

"children were asked twice weekly over a period of 4 weeks to take of taste of a very small portion (~4 g) of the vegetable in its assigned condition."

Repeated exposure: Vegetable intake without dip

Flavor-flavor associative conditioning: Vegetable intake with dip. "Dips served in this experiment included two savory dips (ketchup and ranch-flavored) and one sweet-tasting dip (cinnamon sugar)"

Duration:

4 weeks

Number of contacts:

8 exposure sessions (2 exposures/week)

Setting:

Preschool

Modality:

Face-to-face

Interventionist:

Research staff

Integrity:

No information provided

Date of study:

Unknown

Description of control:

NA

Outcomes

Outcome relating to children's fruit and vegetable consumption:

Consumption of target vegetable (grams). "Children were served a bowl containing 60 g of the vegetable, and children in the AC condition were also served ~60 g of dip in 3.25 oz soufflé cups, which accompanied the vegetable…. Instructions to children prior to the meal were to eat as much as they wanted, not to share food with others, and to remain in their seats…. When children finished snack, spilled or dropped foods were returned to the correct dish and snack trays were cleared. Vegetables were weighed before serving and were weighed after the intake session was complete, and the difference was recorded as vegetable intake."

Outcome relating to absolute costs/cost effectiveness of interventions:

Not reported

Outcome relating to reported adverse events:

Not reported

Length of follow-up from baseline:

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Anzman-Frasca 2012 *(Continued)*

	9 weeks **Length of follow-up post-intervention:** 2 weeks **Subgroup analyses:** None **Loss to follow-up:** There was no loss to follow-up **Analysis:** Unknown if sample size calculation was performed.
Notes	Sensitivity analysis - primary outcome: Primary outcome not stated. Child fruit and vegetable intake 2nd listed outcome measure

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Randomly allocated to experimental group but the random sequence generation procedure is not described
Allocation concealment (selection bias)	Unclear risk	There is no information provided about allocation concealment and therefore it is unclear if allocation was concealed
Blinding of participants and personnel (performance bias) All outcomes	High risk	Participants were not blinded and it seems likely that children may have been influenced by those children around them and whether or not other children had a flavoured dip
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Food was weighed and it is unlikely to be influenced by whether the researchers were blinded to condition
Incomplete outcome data (attrition bias) All outcomes	Low risk	There does not appear to be any attrition and therefore very low risk of attrition bias
Selective reporting (reporting bias)	Unclear risk	There is no study protocol so it is unclear if there was selective outcome reporting
Other bias	Low risk	Contamination bias that could threaten the internal validity is unlikely to be an issue

Bakırcı-Taylor 2019

Methods	**Study design:** Randomised controlled trial **Funding:** *"The Helen Jones Foundation at Texas Tech University provided partial funding for this research."*

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Bakırcı-Taylor 2019 *(Continued)*

Participants	**Description:** Children aged 3-8 years and their parent **N (randomised):** 30 parent-child dyads **Age:** Child (mean): intervention 3.77 years, control 3.64 years Mother (years): 18-24: intervention = 0%, control = 20% 25-30: intervention = 20%, control = 40% 31-35: intervention = 40%, control = 33% 36-45: intervention = 40%, control = 7% **% Female:** Child: intervention = 40%, control = 60% **SES and ethnicity:** Had at least a bachelor's degree: intervention = 73%, control = 74% Incomes of ≥ USD 75,000: overall = 40% Ethnicity White: intervention = 67%, control = 80% Hispanic or Latino: intervention = 20%, control = 7% Black or African American: intervention = 7%, control = 0% Asian or Pacific Islander: intervention = 7%, control = 7% Other: intervention = 0, control = 7% **Inclusion/exclusion criteria:** Inclusion criteria: *"Inclusion criteria included having a child aged 3−8 years, owning a smartphone or tablet, and having a parent and child available to attend study measurement sessions."* No explicit exclusion criteria stated **Recruitment:** *"A convenience sample of parents with children was recruited during 2 weeks at story time sessions at 3 libraries in Lubbock, TX through research staff on-site and posted flyers."* **Recruitment rate:** 100% (30/30) **Region:** Texas (USA)
Interventions	**Number of experimental conditions:** 2 **Number of participants (analysed):**

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Bakırcı-Taylor 2019 *(Continued)*

Intervention = 11 parent-child dyads, control = 14 parent-child dyads

Description of intervention:

"The mobile Jump2Health intervention included 3 components: a mobile website (Jump2Health) which included content on the more fruits and vegetables healthy habit, social media (Facebook page) which provided information that was unavailable on the mobile website and also reinforced information and text found on the website and promoted linked resources on the website, and 12 short message service or text messages about ways to encourage more vegetable and fruit consumption through increased accessibility."

Duration:

10 weeks

Number of contacts:

Unclear (unlimited access to mobile website, 177 posts on fruits and vegetables to Facebook, 12 text messages)

Setting:

Home + library

Modality:

Multiple (website, Facebook, text messages)

Interventionist:

Trained research staff

Integrity:

Recorded reach and engagement

Mobile website: 64% created an account on the password-protected mobile Jump2Health website and 86% visited the mobile website an average of 1–2 times/week.

Facebook: all 11 participants who completed the intervention indicated that they had visited the Facebook page or had seen content from the page on their Facebook News Feed.

Date of study:

Unknown

Description of control:

"Parents in the control group did not receive access to the website or social media; they received 12 text messages only about physical activity."

Outcomes

Outcome relating to children's fruit and vegetable consumption:

Child's intake of fruits and vegetables assessed using the 'The Veggie Meter' which measures the (diet-derived) carotenoid concentration in the skin

Outcome relating to absolute costs/cost-effectiveness of interventions:

Not reported

Outcome relating to reported adverse events:

Not reported

Length of follow-up from baseline:

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Bakırcı-Taylor 2019 *(Continued)*

5 (midpoint) and 10 weeks (follow-up)

Length of follow-up post-intervention:

Immediate

Subgroup analyses:

None

Loss to follow-up (at immediate)

Intervention: 27%

Control: 7%

Analysis:

Unknown if sample size calculation was performed

Notes

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	"During the on-site enrolment process, participants were randomly assigned to 2 groups (control or intervention) via simple randomization. The statistical software R (version 3.1.2, R Foundation for Statistical Computing, Vienna, Austria) was used to determine a large number (approximately 100) of equally likely random group assignments through a fixed seed."
Allocation concealment (selection bias)	Low risk	"Those assignments were then printed out and individually stored in serially numbered, opaque, sealed envelopes. Research staff opened 1 envelope at a time to reveal the assignment for each participant when she arrived for baseline measurements."
Blinding of participants and personnel (performance bias) All outcomes	Low risk	Personnel, parents not blinded. Intervention delivered via webpage, Facebook and text message. Objective biomedical measure and unlikely to be influenced by performance bias
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Objective measure of carotenoid concentrations in the skin
Incomplete outcome data (attrition bias) All outcomes	High risk	Overall: 17%, significantly more participants in intervention (27%) than control (7%) group, no ITT reported Reasons for noncompletion were the same in both groups (change in family schedules and unspecified)
Selective reporting (reporting bias)	Unclear risk	No protocol or trial registration
Other bias	Low risk	Contamination bias that could threaten the internal validity is unlikely to be an issue

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Barends 2013

Methods	**Study design:** Randomised controlled trial **Funding:** *"This project was funded by Wageningen University and Research Centre."*
Participants	**Description:** Healthy infants between 4 and 7 months (not being weaned yet) and their parent **N (Randomised):** 101 parent-infant pairs **Age:** Child (mean): Green beans group = 162 days, Artichoke group = 160 days, Apple group = 165 days, Plum group = 162 days Mother (mean): Green beans group = 31 years, Artichoke group = 30 years, Apple group = 31 years, Plum group = 32 years **% Female:** Child: Green beans group = 54%, Artichoke group = 41%, Apple group = 56%, Plum group = 44% Parent: 96% **SES and ethnicity:** Parents education: Low = 17%, middle = 32%, high = 50% **Inclusion/exclusion criteria:** Inclusion criteria: "Only healthy Children between 4 and 7 months old, who were not being weaned yet, were included in the study." Exclusion criteria: "Children with known food allergies, swallowing or digestion problems, or other medical problems that could influence the ability to eat, were excluded." **Recruitment:** "The participants were recruited from the area of Wageningen and Almere in the Netherlands where both the research locations were. They were recruited via local newspapers, maternity or children welfare centers, postnatal care groups, and a mailing to subscribers of babyinfo.nl (a Dutch advertisement website that gives a box with free products for subscribers expecting a baby)." **Recruitment rate:** Unknown **Region:** Wageningen and Almere (The Netherlands)
Interventions	**Number of experimental conditions:** 4 **Number of participants (analysed):** Green beans group = 24 Artichoke group = 27

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Barends 2013 *(Continued)*

Apple group = 24

Plum group = 24

Description of intervention:

At the lab (days 1,2,17,18 and 19): "A bowl with two jars of vegetable purée was handed to the mother and the mother fed the infant at their usual rate until the end of the feeding was indicated by the infant (i.e. when it rejected the spoon more than three successive times)."

At the home (days 3 - 16): "At the end of the 2nd test-day at the lab, the mothers received the jars of puréed vegetables or fruits for the home exposure period. Each jar was labelled with the date on which it had to be fed to the infant and numbered from 3 to 16 corresponding to the respective days of the intervention period. The feeding was carried out every day at about the same time and in the same way as during days 1 and 2 in the lab."

Duration:

19 days

Number of contacts:

9 exposure sessions

Setting:

Lab and home

Modality:

Face-to-face

Interventionist:

Researchers trained parents to offer the target vegetable or fruit puree to their child

Integrity:

No information provided

Date of study:

Unknown

Description of control:

N/A

Outcomes

Outcome relating to children's fruit and vegetable consumption:

Consumption of target vegetable and fruit purees (grams).

At the lab: "The pre- and post-weight of the bowl including the spoon and bib was weighted to measure the actual intake."

At the home: "The mother was instructed to empty both jars completely on a plate and to put all what was left over after the feeding, including the vegetable purée that was spilled on the table, floor, bib, child's face, etc., back in the jar and to seal the jar with the lid and put it in the refrigerator…. In order to have a standardized measure of home intake, the jars had been pre-weighted in the lab before the home exposure period, and after they were collected and were post-weighted again in the lab."

Outcome relating to absolute costs/cost effectiveness of interventions:

Not reported

Outcome relating to reported adverse events:

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Barends 2013 *(Continued)*

Not reported

Length of follow-up from baseline:

19 days

Length of follow-up post-intervention:

Immediately

Subgroup analyses:

None

Loss to follow-up:

Overall = 2% (not specified by group)

Analysis:

Unknown if sample size calculation was performed

Notes

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Randomly allocated to experimental group but the random sequence generation procedure is not described
Allocation concealment (selection bias)	Unclear risk	There is no information provided about allocation concealment and therefore it is unclear if allocation was concealed
Blinding of participants and personnel (performance bias) All outcomes	High risk	There is no indication whether the mother who fed the child was blind to group allocation. Given the mother fed the child, at high risk of performance bias
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	There is no indication whether the mother who fed the child and weighed the food was blinded to group allocation. Given the food was weighed by the mother the risk of detection bias is unclear
Incomplete outcome data (attrition bias) All outcomes	Low risk	94% retention and therefore risk of attrition bias is low
Selective reporting (reporting bias)	Unclear risk	There is no study protocol, therefore it is unclear if there was selective outcome reporting
Other bias	Low risk	Contamination bias that could threaten the internal validity is unlikely to be an issue

Baskale 2011

Methods

Study design:

Cluster-randomised controlled trial

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Baskale 2011 *(Continued)*

	Funding: *"No external or intramural funding was received."*
Participants	**Description:** Children 5 years of age in 12 nursery schools connected to the Izmir Provincial Directorate of National Education **N (Randomised):** 6 preschools, 238 children **Age:** Child: 5 years of age Mother (mean): Intervention = 33.4 years, Control = 33.4 years Father (mean): Intervention = 36.9 years, Control = 36.8 years **% Female:** Child: Intervention = 60%, Control = 48% **SES and ethnicity:** Education: Mother: Primary = 9%, Secondary school = 15%, High school = 38%, University = 38% Father: Primary = 10%, Secondary school = 14%, High school = 37%, University = 40% Family SES: Low = 16%, Medium = 73%, Upper = 11% **Inclusion/exclusion criteria:** Not specified **Recruitment:** Not specified **Recruitment rate:** Unknown **Region:** Izmir (Turkey)
Interventions	**Number of experimental conditions:** 2 **Number of participants (analysed):** Intervention = 141, Control = 97 **Description of intervention:** "The content of the education guided by Piaget's theory included play and visual materials. Thus, healthy food choices were created by means of play/games. Following age-appropriate education carried out using Piaget's theory, improvements are observed in food selection and consumption" **Duration:** Initial intervention = 6 weeks + at 1 year follow-up a 3 week refresher intervention (20 - 30 minutes per session)

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Baskale 2011 *(Continued)*

Number of contacts:

9 sessions (1 per week)

Setting:

Preschool

Modality:

Face-to-face

Interventionist:

"The researcher (H.B.), who is a nurse educator, was the interventionist for all sessions."

Integrity:

No information provided

Date of study:

February 2007 to June 2008

Description of control:

"The children in the control group had not received nutrition education but they had received a general program of education (the nutrition education prescribed by the Ministry of National Education preschool). The yearly syllabus of the Ministry includes subjects on nutrition every 2 months. This time frame, however, may be insufficient for nutrition education."

Outcomes

Outcome relating to children's fruit and vegetable consumption:

Child's consumption of fruits and vegetables assessed using food frequency questionnaire (FFQ) completed by parents

Outcome relating to absolute costs/cost effectiveness of interventions:

Not reported

Outcome relating to reported adverse events:

Not reported

Length of follow-up from baseline:

Post-test: 4 months (pre-test February 2007 – post-test June 2007)

Post-test 2: 16 months (post-test 2 June 2008)

Length of follow-up post-intervention:

Post-test: 2 months

Post-test 2: 14 months

Subgroup analyses:

None

Loss to follow-up (at 2 and 14 months)

Intervention: 1%, 52%

Control: 9%, 51%

Analysis:

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Baskale 2011 *(Continued)*

	Unclear Sample size calculation was performed.
Notes	Sensitivity analysis - primary outcome: Primary outcome not stated, power calculation conducted on knowledge only

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Randomly allocated to experimental group but the random sequence generation procedure is not described
Allocation concealment (selection bias)	Unclear risk	There is no information provided about allocation concealment and therefore it is unclear if allocation was concealed
Blinding of participants and personnel (performance bias) All outcomes	High risk	Nutrition knowledge & food frequency (self-reported) There is no blinding to group allocation of participants or personnel described and this is likely to influence performance
Blinding of outcome assessment (detection bias) All outcomes	High risk	Nutrition knowledge & food frequency There is no mention that participants were blinded to group allocation and therefore the risk of detection bias is high
Incomplete outcome data (attrition bias) All outcomes	High risk	67/141 (48%) in experimental group and 48/97 (49%) in control group completed post-test 2 and therefore risk of attrition bias is high
Selective reporting (reporting bias)	Unclear risk	There is no study protocol therefore it is unclear if there was selective outcome reporting
Other bias	Low risk	Contamination, baseline imbalance, & other bias that could threaten the internal validity do not appear to be an issue

Black 2011

Methods	**Study design:** Randomised controlled trial **Funding:** Not reported
Participants	**Description:** Low-income mother/toddler (12 - 30 months) dyads **N (Randomised):** Unknown **Age:** Child: mean = 20 months

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Black 2011 *(Continued)*

Mother: mean = 27.4 years

% Female:

Child: 59%

SES and ethnicity:

"67.3% below poverty index, 34% married, 68% black"

Inclusion/exclusion criteria:

Low-income mother (criteria not stated) with toddler 12 - 30 months

Recruitment:

Recruited from WIC (Women, Infants and Children) Clinics

Recruitment rate:

Unknown

Region:

USA

Interventions

Number of experimental conditions: 3

Number of participants (analysed):

Preliminary = 151

Description of intervention:

"Interventions (5 group & 3 individual sessions) used goal setting to promote: 1) parenting practices or 2) maternal diet and physical activity (PA)"

Duration:

Not specified

Number of contacts:

Not specified

Setting:

WIC Clinic

Modality:

Face-to-face

Interventionist:

Unclear

Integrity:

No information provided

Date of study:

Unknown

Description of control:

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Black 2011 *(Continued)*

	Placebo group, sessions provided on toddler safety.
Outcomes	**Outcome relating to children's fruit and vegetable consumption:** Change in vegetable and fruit intake (mypyramid equivalent per 1000 kcal) assessed using 24-hour diet recall completed by parents **Outcome relating to absolute costs/cost effectiveness of interventions:** Not reported **Outcome relating to reported adverse events:** Not reported **Length of follow-up from baseline:** 6 and 12 months **Length of follow-up post-intervention:** Unclear **Subgroup analyses:** None **Loss to follow-up:** Unknown **Analysis:** Unknown if sample size calculation was performed.
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Randomly allocated to experimental group but the random sequence generation procedure is not described
Allocation concealment (selection bias)	Unclear risk	There is no information provided about allocation concealment and therefore it is unclear if allocation was concealed
Blinding of participants and personnel (performance bias) All outcomes	High risk	24-hour diet recall There is no blinding to group allocation of participants or personnel described and this is likely to influence performance
Blinding of outcome assessment (detection bias) All outcomes	High risk	24-hour diet recall There is no mention that participants were blinded to group allocation and therefore the risk of detection bias is high
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	There is no information provided about attrition rates at follow-up

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Black 2011 *(Continued)*

Selective reporting (reporting bias)	Unclear risk	There is no study protocol therefore it is unclear if there was selective outcome reporting
Other bias	Unclear risk	There is insufficient information to determine the risk of other bias

Blissett 2016

Methods	**Study design:** Randomised controlled trial **Funding:** *"Funded by the Feeding For Life Foundation (grant reference number 11-1170)."*
Participants	**Description:** Children aged 2 to 4 years and their principle caregiver (parent) **N (Randomised):** 120 parent-child dyads **Age:** Child (mean): Prompting no modelling = 27 months, Prompting and modelling = 29 months, Modelling 'control' group = 31 months Mothers (mean): Prompting no modelling = 34 years, Prompting and modelling = 26 years, Modelling 'control' group = 35 years **% Female:** Child: 45% Parent: 98% **SES and ethnicity:** Not specified **Inclusion/exclusion criteria:** "Inclusion criteria for children included the absence of known food allergies or disorders affecting eating, current or recent major illness or diagnosed intellectual disabilities." **Recruitment:** "Caregivers and their children were recruited through the Children and Child Laboratory database, which contains information on families in which caregivers have indicated an interest in research participation at the University of Birmingham." **Recruitment rate:** Unknown **Region:** UK
Interventions	**Number of experimental conditions:** 3

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Blissett 2016 *(Continued)*

Number of participants (analysed):

Prompting no modelling = 35 dyads

Prompting and modelling = 37 dyads

Modelling 'control' group = 27 dyads

Description of intervention:

Prompting no modelling: "Caregivers were asked to use physical prompts to eat the novel fruit (NF) (including passing the food to the child, moving the food towards the child, holding the NF up to the child's face, encouraging the child to touch the NF)."

Prompting and modelling: As well as using physical prompts as in PNM, "The caregivers assigned to this condition were also asked to try the NF themselves."

Modelling 'control' group: "Caregivers in this condition were not given any information about prompting, but were simply asked to taste the NF themselves."

Duration:

1 day

Number of contacts:

1

Setting:

Lab

Modality:

Face-to-face

Interventionist:

Parents

Integrity:

Prompting no modelling: "Of an original sample of fifty, fifteen were classed as non-compliant: ten caregivers failed to prompt a minimum of three times, and five caregivers were removed from the group because they ate the NF. This left a sample of thirty-five parents who physically prompted but did not model eating the fruit."

Prompting and modelling: "Of an original sample of forty-three dyads, six were non-compliant because the parent failed to prompt three times or more, leaving a sample of thirty-seven parents who prompted and modelled eating the fruit."

Modelling 'control' group: *"There were twenty-seven dyads in this condition, in which the parent modelled eating of the fruit; all were compliant with this request."*

Date of study:

Unknown

Description of control:

N/A

Outcomes	**Outcome relating to children's fruit and vegetable consumption:** Consumption of novel fruit (grams): "All meal items were weighed on scientific scales before and after consumption."

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Blissett 2016 *(Continued)*

"Owing to differences in weights of the different NF offered, it was not possible to compare conditions based on simple weight of consumption. Therefore, we calculated consumption of the NF based on the percentage consumed of the whole portion offered."

Outcome relating to absolute costs/cost effectiveness of interventions:

Not reported

Outcome relating to reported adverse events:

Not reported

Length of follow-up from baseline:

< 1 day

Length of follow-up post-intervention:

Same day

Subgroup analyses:

None

Loss to follow-up:

Prompting no modelling: 30%

Prompting and modelling: 14%

Modelling 'control' group: No loss to follow-up

Analysis:

Unknown if sample size calculation was performed

Notes

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	The random sequence generation procedure is unclear. The authors indicate that block randomisation was used to allocate to groups in blocks of 10 participants with conditions changing each week, allocated in order of recruitment
Allocation concealment (selection bias)	Unclear risk	There is no information provided about allocation concealment and therefore it is unclear if allocation was concealed
Blinding of participants and personnel (performance bias) All outcomes	Low risk	Fruit intake is an objective measure of child's fruit intake and unlikely to be influenced by performance bias
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Fruit intake All meals were weighed on scientific scales before and after consumption therefore at low risk of detection bias
Incomplete outcome data (attrition bias) All outcomes	High risk	Used a per-protocol analysis rather than an intention-to-treat analysis and therefore at high risk of attrition bias

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Blissett 2016 *(Continued)*

Selective reporting (reporting bias)	Unclear risk	There is no study protocol therefore it is unclear if there was selective outcome reporting
Other bias	Low risk	Contamination bias that could threaten the internal validity is unlikely to be an issue

Campbell 2013

Methods	**Study design:** Cluster-randomised controlled trial **Funding:** *"National Health and Medical Research Council Grant No. 425801"*
Participants	**Description:** First-time mothers and their infants **N (Randomised):** 62 parent groups, 542 parent-child pairs **Age:** Child (mean): Intervention = 3.9 months, Control = 3.9 months Parent (mean): Intervention = 32.5 years, Control = 32.1 years **% Female:** Intervention = 48%, Control = 47% **SES and ethnicity:** Parent: Education level (Completed university degree or beyond): Intervention = 52%, Control = 57% Born in Australia: Intervention = 78%, Control = 78% **Inclusion/exclusion criteria:** Parent groups: Inclusion criteria: "Parent groups were eligible if ≥8 parents enrolled or ≥6 parents enrolled in areas of low socioeconomic position (SEP) because mothers in areas of low SEP are less likely to attend first-time parent groups." No explicit exclusion criteria stated for this trial Parents: Inclusion criteria: "Parents will be eligible to participate if they are able to freely give informed consent, are first-time parents, members of a participating 'first-time parents group' and are able to communicate in English." Exclusion criteria: "Parents will be excluded from the study if they are unable to give informed consent or are unable to communicate in English. Infants with chronic health problems that are likely to influence height, weight, levels of physical activity or eating habits will be excluded from analyses but will be permitted to participate in the study."

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Campbell 2013 *(Continued)*

Recruitment:

"A two-stage random sampling process will be used to select first-time parent groups. At the first stage, twelve local government areas within a 60 km radius of the research centre (Deakin University in Burwood, Victoria, Australia) will be randomly selected."

"At the second stage, first-time parent groups within selected local government areas will be randomly selected, proportional to the total number of first-time parent groups within each area. The first-time parents group currently underway will then be invited to participate."

Recruitment rate:

Parent: 86% (542/630)

Region:

Melbourne (Australia)

Interventions

Number of experimental conditions: 2

Number of participants (analysed):

Intervention = 195, Control = 194

Description of intervention:

"The dietitian-delivered intervention comprised six 2-hour sessions delivered quarterly during the first-time parents' group regular meeting."

The intervention "sought to build knowledge, skills, and social support regarding infant feeding, physical activity, and sedentary behaviors. Messages were anticipatory in nature, such that concepts were presented before the associated child developmental phase."

"Intervention materials incorporated 6 purpose-designed key messages (for example, "Color Every Meal With Fruit and Veg," "Eat Together, Play Together," "Off and Running") within a purpose-designed DVD and written materials. A newsletter reinforcing key messages was sent to participants between sessions."

Duration:

15 months

Number of contacts:

6 sessions at 3-monthly intervals (2 hours per session)

Setting:

Parenting group

Modality:

Multiple (face-to-face, visual and written materials)

Interventionist:

Experienced Dietitian

Integrity:

"Program fidelity was audited via checklists by researchers attending but not delivering the intervention." No further information reported

Date of study:

June 2008 to February 2010

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Campbell 2013 *(Continued)*

	Description of control: "Control parents received usual care from their MCH nurse, who may have provided lifestyle advice."
Outcomes	**Outcome relating to children's fruit and vegetable consumption:** Child's consumption of fruits and vegetable (grams) assessed using 3 x 24hr recalls (3 days, including 1 weekend day) conducted by trained nutritionists via telephone interview with parents **Outcome relating to absolute costs/cost effectiveness of interventions:** Intervention cost per family reported that adjusted "for the fact that a trial setting sees an artificially small number of families included relative to the workforce employed" **Outcome relating to reported adverse events:** Not reported **Length of follow-up from baseline:** 6 (mid-intervention) and 15 months (post-intervention) **Length of follow-up post-intervention:** Immediately **Subgroup analyses:** None **Loss to follow-up (Immediately post-intervention):** Intervention = 28% Control = 28% **Analysis:** Adjusted for clustering. Sample size calculation was performed.
Notes	First reported outcome (grams fruit/day) was extracted for inclusion in the meta-analysis. Sample size per group was not reported and instead calculated based on assumption of equal loss to follow-up per group, and reported baseline sample per group and total sample for diet outcomes at follow-up. Sensitivity analysis - primary outcome: Primary outcome not stated, however power calculation was conducted on fruit or vegetable intake

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Randomly allocated to condition using a computer-generated random number schedule developed by a statistician with no contact with the centres
Allocation concealment (selection bias)	Unclear risk	There is no information provided about allocation concealment and therefore it is unclear if allocation was concealed
Blinding of participants and personnel (performance bias) All outcomes	High risk	24-hour dietary recall (parent reported) Parents were not blinded to group allocation and therefore the risk of performance bias is high

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Campbell 2013 *(Continued)*

Blinding of outcome assessment (detection bias) All outcomes	High risk	24-hour dietary recall (parent reported) Parents were not blinded to group allocation and because this is a self-reported measure the risk of detection bias is high, even though the dietary recalls were administered by telephone by staff blinded to participant's group allocation
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	389/542 (72%) completed the diet outcomes during this long-term assessment. However the number and reasons for dropout is not reported by study group and so cannot establish if reasons for dropouts are similar across groups
Selective reporting (reporting bias)	High risk	There are physical activity outcomes referred to in the protocol that are not reported
Other bias	Low risk	There are no differences in baseline characteristics between trial arms & contamination and other bias unlikely to be an issue

Carney 2018

Methods	**Study design:** Randomised controlled trial – cross-over (as confirmed by the trial author) **Funding:** *"This project was funded by the USDA National Institute of Food and Agriculture via a Childhood Obesity Prevention Training Grant [#2011670013011], as well as USDA Hatch Act [PEN04565] funds."*
Participants	**Description:** Children aged 4-5 years old and their parent **N (Randomised):** 48 parent-child dyads **Age:** Child (mean): 54.2 months **% Female:** Child: 43% Parent: 95% **SES and ethnicity:** Parents were predominantly white (n = 41), college educated (n = 39) with an annual household income > USD 50,000 (n = 27) **Inclusion/exclusion criteria:** No explicit inclusion criteria stated Exclusion criteria: *"children were excluded at screening for not meeting eligibility criteria (i.e., parents reported they would not eat the test meal foods, would not be comfortable in a room without a parent, were taking medication that can affect taste or appetite, etc.)"* **Recruitment:**

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Carney 2018 *(Continued)*

	"child/parent dyads were screened over the phone based on responses to flyers and advertisements posted on local parent/family websites." **Recruitment rate:** 75% (48/64) **Region:** Pennsylvania (USA)
Interventions	**Number of experimental conditions:** 2 **Number of participants (analysed):** 44 parent-child dyads **Description of intervention:** *"On each of the two visits, children consumed an ad libitum multiitem test meal consisting of macaroni and cheese (175 g), unsweetened applesauce (115 g), 2% milk (240 g), water (465 g), and three servings of microwave-steamed crinkle cut carrots (40 g each)."* *"In the Variety condition, each serving of carrots was seasoned with one of three spice blends (Cinnamon-Nutmeg-Ginger, Cardamom-Cumin-Allspice, and Garlic-Black Pepper-Oregano). In the No Variety condition, carrots were all seasoned with the cinnamon blend, but were served in separate bowls to be consistent in appearance with the Variety condition."* **Duration:** 1 week **Number of contacts:** Two, 2-hour visits **Setting:** Lab **Modality:** Face-to-face **Interventionist:** Research assistant **Integrity:** No information provided **Date of study:** February 2015-November 2016 **Description of control:** N/A
Outcomes	**Outcome relating to children's fruit and vegetable consumption:** Child's consumption of carrots (grams). *"Foods were weighed to the nearest±0.1 g in their serving container just before the meal, and again immediately following the meal. Intake was calculated as the difference between these weights. All food preparation and weighing occurred out of sight from the child or parent."*

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Carney 2018 *(Continued)*

Outcome relating to absolute costs/cost-effectiveness of interventions:

Not reported

Outcome relating to reported adverse events:

Not reported

Length of follow-up from baseline:

1 week

Length of follow-up post-intervention:

Immediate

Subgroup analyses:

None

Loss to follow-up (at immediate)

Overall = 8% (not specified by group)

Analysis:

Unknown if sample size calculation was performed

Notes

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Trial author confirmed meal intake order was randomised and counterbalanced between groups but no other detail in manuscript
Allocation concealment (selection bias)	Unclear risk	No information provided
Blinding of participants and personnel (performance bias) All outcomes	Low risk	Personnel and children were not blinded but objective measure of child's vegetable intake and unlikely to be influenced by performance bias
Blinding of outcome assessment (detection bias) All outcomes	Low risk	No blinding but consumption of carrots objectively measured using weight (grams) by trained researcher
Incomplete outcome data (attrition bias) All outcomes	Low risk	8% attrition, no ITT reported. Children were excluded after first visit because child refused to participate and/or would not taste any of the carrots
Selective reporting (reporting bias)	Unclear risk	Unclear: no protocol, trial registration
Other bias	Low risk	Contamination bias: cross-over trial, no risk

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Caton 2013

Methods	**Study design:** Randomised controlled trial **Funding:** *"This research has received funding from the European Community's Seventh Framework Programme (FP7/2007-3) under grant agreement no. 245012-HabEat coordinated by Dr Sylvie Issanchou. (INRA, UMR 1324, Centre de Sciences du Gou ˆt et de l'Alimentation, F-21000 Dijon France)."*
Participants	**Description:** Children aged 6 to 36 months in private daycare nurseries in West and South Yorkshire, UK **N (Randomised):** Unclear "Of the 108 recruited, fourteen children were excluded due to food allergies (n 3) and for being older than 40 months (n 11). Of the ninety-four children, six children refused to take part in the study, fifteen were excluded due to lack of attendance at nursery and one was removed for incomplete exposures. Table 2 provides characteristics of the children who took part in the intervention. Out of the potential sample, seventy-two completed the Study." **Age:** Mean: Repeated exposure = 24 months, Flavour-flavour learning = 23 months, Flavour-nutrient learning = 24 months **% Female:** Repeated exposure = 55%, Flavour-flavour learning = 48%, Flavour-nutrient learning = 68% **SES and ethnicity:** Unclear, "to ensure good representation of ethnic background and SES we selected nurseries in a variety of different locations in West and South Yorkshire, UK" **Inclusion/exclusion criteria:** No explicit inclusion criteria stated for this trial "All children reported to have any food allergies were excluded from taking part in the investigation." **Recruitment:** "In the first instance, nursery managers were given details of the study to check their interest in the study. If the nursery managers expressed an interest, then the participant information sheets and consent forms were distributed to parents." **Recruitment rate:** Unknown **Region:** West and South Yorkshire (UK)
Interventions	**Number of experimental conditions:** 3 **Number of participants (analysed):** Repeated exposure = 22 Flavour-flavour learning = 25 Flavour-nutrient learning = 25

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Caton 2013 *(Continued)*

Description of intervention:

"Around 2–4 d after the pre-intervention period, each child was offered one pot (100 g) of artichoke for ten exposures."

Repeated exposure: "The RE recipe was a basic vegetable puree."

Flavour-flavour learning: "For the FFL puree, the chosen unconditioned stimulus was sweetness. The selected sweet ingredient was sucrose."

Flavour-nutrient learning: "For the FNL puree, the chosen unconditioned stimulus was a higher energy density. The selected energy-dense ingredient was sunflower oil, because of its relatively neutral taste."

Duration:

10 days

Number of contacts:

10

Setting:

Preschool

Modality:

Face-to-face

Interventionist:

Nursery staff

Integrity:

No information provided

Date of study:

Recruitment took place February – May 2011

Description of control:

N/A

Outcomes

Outcome relating to children's fruit and vegetable consumption:

Consumption of novel vegetable (artichoke) (grams) and changes in intake (grams) between a familiar (carrot) and novel vegetable (artichoke)

"All pots were weighed before and after to determine intake (g) throughout the experiment. Any spillage on tables and bibs were collected after the session and were added back in to the pots before re-weighing."

Outcome relating to absolute costs/cost effectiveness of interventions:

Not reported

Outcome relating to reported adverse events:

Not reported

Length of follow-up from baseline:

Unclear

Length of follow-up post-intervention:

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Caton 2013 *(Continued)*

5 weeks

Subgroup analyses:

None

Loss to follow-up:

Repeated exposure = 27%

Flavour-flavour learning = 40%

Flavour-nutrient learning = 46%

Analysis:

Unknown if sample size calculation was performed.

Notes

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Randomly allocated to experimental group but the random sequence generation procedure is not described
Allocation concealment (selection bias)	Unclear risk	There is no information provided about allocation concealment and therefore it is unclear if allocation was concealed
Blinding of participants and personnel (performance bias) All outcomes	Low risk	Vegetable intake (objective) Objective measure of child's vegetable intake and staff were blinded to the target vegetable being offered to the children
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Vegetable intake (objective) Food was weighed to determine intake and staff were blinded to the target vegetable being offered to the children
Incomplete outcome data (attrition bias) All outcomes	High risk	Of the 72 children taking part in the study 45 (63%) completed the follow-up and so the risk of attrition bias is high
Selective reporting (reporting bias)	Unclear risk	There is no study protocol therefore it is unclear if there was selective outcome reporting
Other bias	Low risk	Contamination bias that could threaten the internal validity is unlikely to be an issue

Cohen 1995

Methods

Study design:

Randomised controlled trial

Funding:

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Cohen 1995 *(Continued)*

"Supported jointly by the Thrasher Research Fund; the World Health Organization; UNICEF/Honduras and the Institute for Reproductive Health (formerly the Institute for International Studies in Natural Family Planning), Georgetown University, under a Co-operative Agreement with the U.S. Agency for International Development (A.I.D.) (DPE-3040-A-00-5064-00 and DPE-3061-A-00-1029-00)."

Participants	**Description:** Low income, first time mothers and their infants **N (Randomised):** 152 children **Age:** Infants: Infants were randomised at 16 weeks of age Mother (mean): 20.2 years **% Female:** 55% **SES and ethnicity:** "Subjects came from low income neighborhoods in which environmental sanitation was poor (only 60% of the households had indoor piped water). Mean household income was $120/mo." **Inclusion/exclusion criteria:** Inclusion criteria: "Selection criteria were that mothers be primiparous, willing to exclusively breast-feed for 26 wk, not employed outside the home prior to 6 mo postpartum, low income (less than $150/mo), at least 16 years old and healthy (not taking medication on a regular basis), and that infants be healthy, term, and weigh at least 2000g at birth." Exclusion criteria: "Multiparous and working mothers were excluded because the intervention required a 3-d stay in the La Leche League unit on three occasions to measure breast milk intake." **Recruitment:** "Subjects were recruited from two public hospitals in San Pedro Sula, Honduras" **Recruitment rate:** 86% (152/176) **Region:** San Pedro Sula, Honduras
Interventions	**Number of experimental conditions:** 3 **Number of participants (analysed):** Solid foods: 42 Solid foods + maintenance: 39 Exclusive breast-feeding: 42 **Description of intervention:** Solid foods: introduction of solid foods at 4 months, with breast-feeding as required 4-6 months. Solids foods + maintenance: introduction of solid foods at 4 months, with mothers told to continue breast-feeding as often as they had prior to the intervention.

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Cohen 1995 *(Continued)*

Exclusive breast-feeding: exclusive breast-feeding to 6 months; no other liquids (water, milk, formula) or solids

In addition all mothers:

1. Stayed at the la Leche League unit at 16 weeks for 3-days and returned to the unit at weeks 21 and 26 weeks for repeated measurements.

2. Received weekly home visits during the intervention period to collect data on breast-feeding and infant morbidity.

In the solid food groups these weekly visits also were used to monitor use of the foods provided and encourage mothers in the maintenance group to maintain their re-intervention breast-feeding frequency.

Duration:

2 months

Number of contacts:

13 (10 weekly home visits + 5 hospital visits)

Setting:

Home + hospital

Modality:

Face-to-face

Interventionist:

Mothers

Integrity:

"To encourage compliance with study procedures, mothers recorded the number of breastfeeds each day from 16 to 26 weeks on a simple form provided weekly. This was especially important for the SF-M mothers, who were asked to maintain breastfeeding frequency. At 19 and 24 weeks, 12-hour in-home observations were conducted to record breastfeeding frequency and duration, and adherence to the feeding instructions."

Date of study:

Recruited from October 1991-January 1993

Description of control:

N/A

Outcomes	**Outcome relating to children's fruit and vegetable consumption:** Consumption of fruit (grams): "the amount of food offered and consumed at the midday meal was measured (using an electronic scale, to the nearest gram)" **Outcome relating to absolute costs/cost-effectiveness of interventions:** Not reported **Outcome relating to reported adverse events:** Not reported **Length of follow-up from baseline:** 9 and 12 months

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Cohen 1995 *(Continued)*

Length of follow-up post-intervention:

2.5 and 5.5 months

Subgroup analyses:

None

Loss to follow-up (at 9 and 12 months):

Unclear - states "for a subsample of infants, n=60 at 9 months and n= 123 at 12 months"

Analysis:

Unknown if sample size calculation was performed

Notes	First reported outcome (frequency of consuming fruit) at 9 months for the < 12 months was extracted for inclusion in meta-analysis. Sensitivity analysis - primary outcome: primary outcome not stated, fruit or vegetable consumption was not first reported outcome (first reported outcome was dairy).

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	High risk	"At 16 wk, subjects were randomly assigned, by week of infant's birth, to one of three groups: 1) Control: Exclusive breast-feeding to 26 wk (EBF); 2) Solid Foods: Introduction of solid foods at 16 wk (SF), with ad libitum breast-feeding; or 3) Solid Foods-M: Introduction of solid foods at 16 wk (SF-M), with mothers told to continue breast-feeding as often as they had prior to the intervention." Allocated to group by week of birth.
Allocation concealment (selection bias)	Unclear risk	There is no information provided about allocation concealment and therefore it is unclear if allocation was concealed from those conducting the research.
Blinding of participants and personnel (performance bias) All outcomes	High risk	"Subjects were not informed of their assignment until they had completed the first 16 wk of the study." "All women were visited weekly during the first 4 mo postpartum to assist them in maintaining exclusive breast-feeding." Due to the nature of the intervention, both participants and personnel were aware of group allocation after 16 weeks.
Blinding of outcome assessment (detection bias) All outcomes	High risk	"During the 9- and 12-mo visits, the amount of food offered and consumed at the midday meal was measured (using an electronic scale, to the nearest gram) for a subsample of infants (n = 60 at 9 mo, n = 123 at 12 mo), and their mothers were interviewed regarding the infants' usual daily food intake and acceptance and frequency of consumption of a variety of common foods." It is unclear whether outcome assessors visiting the home were aware of group allocation. Mothers self-reported food intake and acceptance.
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	"Home visits were conducted for a subsample only (total n=141). 9mth n=60; 12 mth n=123." Unclear if this is actual subsample or if this reflects attrition/non-response

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Cohen 1995 *(Continued)*

		It is unclear whether the n value for the subsample represents everyone who was eligible (i.e. had infants younger than 12 months prior to May 1993) with 100% consent rate, or if there were refusals.
Selective reporting (reporting bias)	Unclear risk	There is no trial registration or protocol.
Other bias	Low risk	Contamination bias that could threaten the internal validity is unlikely to be an issue

Cooke 2011

Methods	**Study design:** Cluster-randomised controlled trial **Funding:** *"This research was supported by a grant from the Medical Research Council National Prevention Research Initiative."*
Participants	**Description:** 422 children in reception (4 to 5 years) and Year 1 (5 to 6 years) from 16 classes in 8 schools. **N (Randomised):** 16 classes, 472 children **% Female:** 47% female **Age:** Reception: 4 to 5 years (N = 216) Year 1: 5 to 6 years (N = 206) **SES and ethnicity:** “To ensure adequate representation of children from families of low socioeconomic status, we selected schools in which the proportions of pupils who were eligible for free school meals, who spoke English as a second language, and who came from minority ethnic backgrounds were above the national average." No individual child data on these variables were reported. **Inclusion/exclusion criteria:** Not stated **Recruitment:** Recruited from 16 classes in 8 schools (492 children, 472 consented) **Recruitment rate:** Children: 96% (472/492) Schools: unknown **Region:**

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Cooke 2011 *(Continued)*

	United Kingdom
Interventions	**Number of experimental conditions:** 4 **Number of participants (analysed):** Exposure + tangible non-food reward (sticker) = 99 Exposure + social reward (praise) = 106 Exposure alone = 105 Control = 112 **Description of interventions:** “Children in the intervention conditions (ETR, EP, EA)* were seen individually from Day 3 to Day 14 and offered a small piece of their target vegetable.” Exposure + tangible non-food reward: “Children in the ETR condition were told that if they tasted the vegetable, they could choose a sticker as a reward.” Exposure + social reward: “Children in the EP condition were praised if they tasted the vegetable (e.g. “Brilliant, you're a great taster”) Exposure alone: “Children in the EA condition were invited to taste the target vegetable but received minimal social interaction.” **Duration:** 3 weeks **Number of contacts:** 12 exposure sessions **Setting:** School **Modality:** Face-to-face, exposure **Interventionist:** Trained researchers **Integrity:** “Children in the three intervention groups agreed to taste their target vegetable in most sessions" Exposure + tangible non-food reward (sticker): *M* = 11.34 sessions, *SD* = 1.45 Exposure + social reward (praise): M = 10.45 sessions, SD = 1.94; Exposure alone: *M* = 9.97 sessions,*SD* = 2.87. “Post hoc analyses showed higher compliance in the ETR condition than in the EP or EA conditions ($p < 0.05$), and compliance in the latter two conditions did not differ.” **Date of study:** Unknown **Description of control:**

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Cooke 2011 *(Continued)*

	No-treatment control: "Children in the control group did not receive taste exposure to the target vegetable during the intervention period."
Outcomes	**Outcome relating to children's fruit and vegetable consumption:** As-desired consumption of target vegetable (grams). "The child was then invited to eat as much of the vegetable as he or she wanted, with intake (in grams) assessed by weighing the dish before and after consumption using a digital scale" (NB. "Care was taken to ensure that children in the ETR condition understood that the sticker reward was no longer available.") **Length of follow-up from baseline:** Acquisition data: day 15 Maintenance data: 1 month and 3 months later **Subgroup analyses:** None **Loss to follow-up (at 1 month and 3 months follow-up):** Exposure + tangible non-food reward (sticker): 7%, 9% Exposure + social reward (praise): 8%, 5% Exposure alone: 8%, 8% Control: 11%, 6% **Analysis:** Analysis adjusted for clustering"Clustering by school was minimal; therefore, the final analyses adjusted only for clustering by class." Sample size calculation was performed "On the basis of evidence that 10 exposures are needed to alter preferences, we decided to repeat all analyses for a restricted subset of children who tasted their target vegetable on at least 10 days (n=365). Because there were no significant differences between the restricted and the full samples, results are reported for the full sample."
Notes	Sensitivity analysis - primary outcome: Primary outcome not stated, fruit and vegetable intake 2nd listed outcome after liking

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Contact with the author indicated that the study used blocked randomisation performed using an online randomiser programme
Allocation concealment (selection bias)	Unclear risk	Randomisation occurred prior to consent. Head teachers were not aware of group allocation. It is unclear if study personnel knew of allocation.
Blinding of participants and personnel (performance bias) All outcomes	Low risk	Contact with the author indicated that personnel were not blind to group allocations and that there was the potential that participants became aware of group allocation. However, given the objective outcome measure, review authors judged that the outcome would not be influenced by lack of blinding
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Contact with the author indicated that some, but not all of the outcome assessors were blind to group allocation. The outcome measurement (grams of tar-

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Cooke 2011 *(Continued)*

		get vegetable consumed, as measured by a digital scale) was objective and unlikely to have been influenced by lack of blinding
Incomplete outcome data (attrition bias) All outcomes	Low risk	Although reasons for missing data were not provided by group, rates of loss to follow-up were low and similar across all experimental arms of the trial at both follow-up points (Exposure+sticker = 6.5%, 8.8%; Exposure+praise = 8.2%, 5.0%; Exposure alone = 8.2%, 8.2%; Control = 10.9%, 5.7%, provided by the author). No reasons were reported for loss to follow-up
Selective reporting (reporting bias)	Unclear risk	Insufficient information to permit judgement Trial was registered, but not prospectively (ISRCTN42922680)
Other bias	Low risk	No further risks of bias identified

Correia 2014

Methods	**Study design:** Randomised controlled trial – cross-over **Funding:** *"This project was part of a larger study funded by the Robert Wood Johnson Foundation Healthy Eating Research program."*
Participants	**Description:** Preschoolers enrolled in a Child and Adult Care Food Programme-participating childcare centre **N (Randomised):** 57 children **Age:** Mean = 4.4 years **% Female:** 35% **SES and ethnicity:** “Among the children’s racial and ethnic backgrounds, 41.1% were non-Hispanic black, 37.5% were non-Hispanic white, 14.3% were Hispanic, and 7.1% were Asian. The median total family income was $33,600 (interquartile range, $19,337–$57,000).” **Inclusion/exclusion criteria:** “Preschool children enrolled full time were eligible for participation in the study." No explicit exclusion criteria stated for this trial **Recruitment:** “One large, racially diverse child care center in Connecticut was recruited for participation in the study in 2011.” **Recruitment rate:** 79% (57/72)

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Correia 2014 *(Continued)*

	Region: Connecticut (USA)
Interventions	**Number of experimental conditions:** 2 **Number of participants (analysed):** Condition 1: the pairing of a vegetable with a familiar, well-liked food (lunch) = 43 Condition 2: enhancing the visual appeal of a vegetable (snack) = 42 **Description of intervention:** "Classrooms were randomly assigned to first participate in either the intervention or control condition for lunch (condition 1) and snack (condition 2)." "The children participated in the second condition one week after the first condition for each meal." Condition 1: "Steamed broccoli on top of the pizza" Condition 2: "Raw cucumbers arranged as a caterpillar with chive antennae and an olive eye." **Duration:** 2 days (1 day per condition) **Number of contacts:** 2 (1 per condition) **Setting:** Preschool **Modality:** Face-to-face **Interventionist:** Teachers and researchers **Integrity:** No information provided **Date of study:** 2011 **Description of control:** Condition 1: "Steamed broccoli on the side of the pizza" Condition 2: "Raw cucumbers as semicircular half-slices with chive and an olive on the side."
Outcomes	**Outcome relating to children's fruit and vegetable consumption:** The two primary outcome measures were: 1. Willingness to taste (defined as consumption of 3 grams or more of the test vegetable) and 2. Total consumption of the test vegetable (grams) "Researchers weighed the children's meals in the center's cafeteria in accordance with the CACFP-recommended preschool serving sizes for all meal components before delivering them to the classrooms.

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Correia 2014 *(Continued)*

After the meal was completed, researchers weighed the plate waste of meal components in the cafeteria. All weights were recorded to the nearest 0.1 g on a digital electronic balance."

Outcome relating to absolute costs/cost effectiveness of interventions:

Not reported

Outcome relating to reported adverse events:

Not reported

Length of follow-up from baseline:

<1 day

Length of follow-up post-intervention:

Same day

Subgroup analyses:

None

Loss to follow-up:

Condition 1 = 25%

Condition 2 = 26%

Analysis:

Sample size calculation was performed.

Notes

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Randomly allocated to experimental group but the random sequence generation procedure is not described
Allocation concealment (selection bias)	Unclear risk	There is no information provided about allocation concealment and therefore it is unclear if allocation was concealed
Blinding of participants and personnel (performance bias) All outcomes	Low risk	Vegetable intake (objective) Objective measure of child's vegetable intake and unlikely to be influenced by performance bias
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Vegetable intake (objective) Food was weighed to determine intake, but it is unlikely to be influenced by whether the researchers were blinded to condition
Incomplete outcome data (attrition bias) All outcomes	High risk	Of the 57 participants 43 (75%) and 42 (74%) were present for both days of lunch and/or snack data collection respectively. Attrition > 20% for short-term assessments
Selective reporting (reporting bias)	Unclear risk	There is no study protocol therefore it is unclear if there was selective outcome reporting

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Correia 2014 *(Continued)*

Other bias	Low risk	Contamination bias that could threaten the internal validity is unlikely to be an issue

Cravener 2015

Methods	**Study design:** Randomised controlled trial **Funding:** *"College of Health and Human Development (Pennsylvania State University)"*
Participants	**Description:** Children aged 3 to 5 years with low vegetable intake **N (Randomised):** 24 children **Age:** Mean: Intervention = 3.8 years, Control = 4.0 years **% Female:** Intervention = 50%, Control = 50% **SES and ethnicity:** “The majority of the participants were white (92%) and 83.3% of mothers and 82.6% of fathers reported graduating from college and/or graduate school.” **Inclusion/exclusion criteria:** Inclusion criteria: children aged 3 - 5 years, categorised as “at risk for obesity” based on family history, defined as having at least one parent with a body mass index > 25 and consuming 2 or fewer servings of vegetables per day (according to parent report) Exclusion criteria: pre-existing medical conditions (including relevant food allergies) **Recruitment:** “recruited via flyers posted around the university community and in local newspapers and websites (e.g. Craigslist).” **Recruitment rate:** Unknown **Region:** Pennsylvania (USA)
Interventions	**Number of experimental conditions:** 2 **Number of participants (analysed):** Intervention = 12, Control = 12 **Description of intervention:**

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Cravener 2015 *(Continued)*

"children in the treatment group (n=12) received vegetables packaged in containers decorated with their four favorite cartoon characters (selected on the first visit) and granola bars in generic packaging. All vegetable packages contained sticker incentives and children could collect stickers on a special game board and trade them for small prizes at the end of the study. This was done to simulate the concept of promotions that often come with packaged foods. Parents were in charge of deciding when children had eaten enough of a vegetable to be awarded the sticker for their game boards."

Duration:

2 weeks

Number of contacts:

Parents were instructed "to offer children a choice between either a vegetable or granola bar for at least three snacks and/or meals per day."

Setting:

Home + lab

Modality:

Face-to-face

Interventionist:

Parents

Integrity:

"To assess compliance, parents completed daily checklists across the intervention to report when vegetables and granola bars were offered and record what children selected. In addition, parents could also report additional comments on these checklists to report other concerns or deviations. Parents were also responsible for keeping daily food diaries for children (data to be reported elsewhere). These logs were reviewed with parents during weekly home visits to assess progress."

Date of study:

Recruitment August 2012 to June 2013

Description of control:

"children in the control group (n=12) received weekly supplies of generic-packaged vegetables and granola bars presented as part of a free choice at meals and snacks.."

Outcomes

Outcome relating to children's fruit and vegetable consumption:

Children's intake of vegetables (grams), "Intake was measured as the difference between pre- and post-weights of the foods provided."

Outcome relating to absolute costs/cost effectiveness of interventions:

Not reported

Outcome relating to reported adverse events:

Not reported

Length of follow-up from baseline:

4 weeks

Length of follow-up post-intervention:

1 week

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Cravener 2015 *(Continued)*

	Subgroup analyses: None **Loss to follow-up:** There was no loss to follow-up **Analysis:** Sample size calculation was performed.
Notes	First reported outcome (broccoli intake grams/day) at the longest follow-up (4-week follow-up) was extracted for inclusion in meta-analysis Sensitivity analysis - primary outcome: Fruit or vegetable intake is primary outcome

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Randomly assigned to condition using a random-number generator.
Allocation concealment (selection bias)	Unclear risk	There is no information provided about allocation concealment and therefore it is unclear if allocation was concealed
Blinding of participants and personnel (performance bias) All outcomes	Low risk	Outcome group: All/ Children's vegetable and granola bar intake Families and researchers were not blinded to condition but it is unlikely that this influenced child consumption
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Outcome group: All/ Children's vegetable and granola bar intake Families and researchers were not blinded to condition and it is unclear if this had an impact on the weighing of food. The extent to which parents were compliant with instructions to return all leftovers is unknown
Incomplete outcome data (attrition bias) All outcomes	Low risk	Outcome group: All/ 100% retention rate and so risk of attrition bias is very low
Selective reporting (reporting bias)	Unclear risk	There is no study protocol therefore it is unclear if there was selective outcome reporting
Other bias	Low risk	Contamination bias that could threaten the internal validity is unlikely to be an issue

Daniels 2014

Methods	**Study design:** Randomised controlled trial **Funding:** *"Research relating to this article was funded 2008-2014 by two consecutive grants from the Australian National Health and Medical Research Council (426704, APP1021065); HJ Heinz (to KM); Meat and Livestock*

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Daniels 2014 *(Continued)*

	Australia; Department of Health South Australia; Food Standards Australia New Zealand; and Queensland University of Technology."
Participants	**Description:** First-time mothers with healthy term infants **N (Randomised):** 698 mother-infant dyads **Age:** Child (mean): Intervention = 4.3 months, Control = 4.3 months Mother (mean): Intervention = 30.2 years, Control = 29.9 years **% Female:** Child: Intervention = 51%, Control = 50% **SES and ethnicity:** Mother: Education (university degree) = 59% Origin (born in Australia) = 79% SEIFA Index of Relative Advantage and Disadvantage (relative disadvantage ≤ 7th decile) = 33% **Inclusion/exclusion criteria:** Inclusion criteria: “Inclusion criteria were ≥18 years of age, infants >35 weeks gestation, and birth weight ≥2500 g, living in the study cities, facility with written and spoken English” Exclusion criteria: “Mother-infant dyads will be excluded if the infant has any diagnosed congenital abnormality or chronic condition likely to influence normal development (including feeding behaviour) or the mother has a documented history of domestic violence or intravenous substance abuse or self-reports eating, psychiatric disorders or mental health problems.” **Recruitment:** “A consecutive sample of first-time mothers with healthy term infants was approached at seven maternity hospitals” “Consenting mothers were recontacted for full enrolment when their infant was four (range 2-7) months old.” **Recruitment rate:** 16% (698/4376) **Region:** Brisbane and Adelaide (Australia)
Interventions	**Number of experimental conditions:** 2 **Number of participants (analysed):** Intervention = 291, Control = 307 **Description of intervention:**

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Daniels 2014 *(Continued)*

"The first intervention module started immediately after baseline (children aged 4-7 months) with the second module commencing 6 months after completion of the first (children aged 13-16 months). Each module comprised six interactive group sessions (10-15 mothers per group, total 40 groups) of 1-1.5 hours duration, co-facilitated by a dietitian (n=13) and psychologist (n=13). Developmentally appropriate content addressed: (i) repeated neutral exposure to unfamiliar foods combined with limiting exposure to unhealthy foods to promote healthy food preferences and (ii) responsive feeding that recognizes and responds appropriately to cues of hunger and satiety to promote self-regulation of energy intake to need. A third theme was "feeding is parenting" and positive parenting (encouragement of autonomy, warmth, self-efficacy)."

Duration:

12 months (12 weeks duration for Modules 1 and 2 respectively, with 6-month gap between Module 1 and 2)

Number of contacts:

12 group sessions

Setting:

Child health clinics

Modality:

Face-to-face, group sessions

Interventionist:

Co-facilitated by a dietitian and psychologists

Integrity:

No information provided

Date of study:

2008 to 2011

Description of control:

"The control group had access to universal community child health services, which, at the mother's initiative, could include child weighing and web- or telephone-based information. An important distinction was that controls did not receive anticipatory guidance but sought advice on a specific problem."

Outcomes

Outcome relating to children's fruit and vegetable consumption:

Child's consumption of fruits and vegetables, "assessed using a three-pass 24-hour dietary recall conducted via telephone by a dietitian trained"

Outcome relating to absolute costs/cost effectiveness of interventions:

Not reported

Outcome relating to reported adverse events:

Not reported

Length of follow-up from baseline:

20 months and 4.5 years

Length of follow-up post-intervention:

6 months and 3.5 years

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Daniels 2014 *(Continued)*

	Subgroup analyses: None **Loss to follow-up:** Intervention = 26% Control = 19% **Analysis:** Sample size calculation was performed.
Notes	First reported outcome (vegetable intake g/kg body weight) at the longest follow-up < 12 months (6 months after intervention completion) and ≥ 12 months (3.5 years after intervention completion) was extracted for inclusion in meta-analysis. Sensitivity analysis - primary outcome: Primary outcome not stated, however power calculation was conducted on fruit or vegetable consumption

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Randomly assigned to condition using permuted-blocks randomisation schedule generated by the Institute's Research Methods Group, which includes this study's statistician, all of whom will otherwise not be involved in data collection or intervention delivery
Allocation concealment (selection bias)	Unclear risk	There is no information provided about allocation concealment and therefore it is unclear if allocation was concealed
Blinding of participants and personnel (performance bias) All outcomes	High risk	Outcome group: All/ Food intake records, food preference, feeding behaviour (self-reported) There is no blinding to group allocation of participants or personnel described and this is likely to influence performance
Blinding of outcome assessment (detection bias) All outcomes	High risk	There is no blinding to group allocation of participants described, and because self-reported measures at high risk of detection bias
Incomplete outcome data (attrition bias) All outcomes	High risk	There was 22% attrition at short-term follow-up and dropout was significantly higher in the intervention than the control group
Selective reporting (reporting bias)	Low risk	The measures reported in the protocol paper align with those reported in the outcome papers
Other bias	Low risk	Contamination bias that could threaten the internal validity is unlikely to be an issue

De Bock 2012

Methods	**Study design:** Cluster-randomised controlled trial

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De Bock 2012 *(Continued)*

	Funding: *"This work was supported by a grant from the Baden-Württemberg Stiftung." "F.D.B. is supported by the European Social Fund and by the Ministry of Science, Research and the Arts Baden-Württemberg."*
Participants	**Description:** Children aged 3 to 6 years in 18 preschools from 3 south German regions **N (Randomised):** 18 preschools, 377 children **Age:** Mean = 4.26 years **% Female:** 47% **SES and ethnicity:** Child: 32.4% came from an immigrant background Education levels (mother): Low = 16%, Middle = 56%, High = 21% **Inclusion/exclusion criteria:** "Pre-schools were eligible to participate in the study if they were located in one of three predefined regions and had applied to participate in the nutritional intervention module of a state-sponsored health promotion programme 'Komm mit in das gesunde Boot' ('Come aboard the health boat'), with at least fifteen children participating." "Children between 3 and 6 years of age attending one of the participating pre-schools and participating in the programme were considered eligible for our study." No explicit exclusion criteria stated for this trial **Recruitment:** Preschools: Selected from a group of preschools who had already "applied to participate in the nutritional intervention module of a state-sponsored health promotion programme." **Recruitment rate:** Preschool: 64% (18/28) Child: 80% (377/473) **Region:** 3 regions in Baden-Württemberg (Germany)
Interventions	**Number of experimental conditions:** 2 **Number of participants (analysed):** 202 children (not specified by group) **Description of intervention:** "Intervention activities consisted of familiarizing with different food types and preparation methods as well as cooking and eating meals together in groups of children, teachers and parents. One session additionally focused on healthy drinking behaviours."

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De Bock 2012 *(Continued)*

Of the 15 sessions, five actively involved "parents by targeting them alone (discussions on parents' modelling role and nutritional needs of children) or together with their children."

"Models for healthy eating within the intervention included: (i) use of nutrition experts; (ii) play acting with 'pirate dolls' used as props enjoying fruit and vegetables; (iii) active parental involvement; and (iv) involvement of other pre-school peers. The exposure effect was taken into account by repeatedly offering healthy snacks like fruit and vegetables and water to the children every week."

Duration:

6 months

Number of contacts:

15 sessions (1/week, 2hr per session)

Setting:

Preschool

Modality:

Face-to-face

Interventionist:

"The intervention was delivered by external nutrition experts"

"Pre-school group teachers assisted the external nutrition expert during each session to enable them to sustain intervention-related activities after the study end."

Integrity:

"Implementation rate was high with all modules delivered completely (5.0/5); no session was cancelled."

"Intervention fidelity was high with the majority of interventions delivered as planned."

Date of study:

2008 to 2009

Description of control:

Waiting-list control, "received the same intervention 6 months later than the intervention arm"

Outcomes

Outcome relating to children's fruit and vegetable consumption:

Change in child's consumption of fruits and vegetables (portions/day) assessed using a questionnaire by parent self-report

Outcome relating to absolute costs/cost effectiveness of interventions:

Not reported

Outcome relating to reported adverse events:

Not reported

Length of follow-up from baseline:

6 and 12 months

Length of follow-up post-intervention:

Immediately and 6 months

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De Bock 2012 *(Continued)*

Subgroup analyses:

None

Loss to follow-up:

"Of 348 pre-school children, 29.6% completed all three measurements, 51.4% two measurements and 19% one measurement with 58% providing both pre- and post-intervention measurements." Individual loss to follow-up data not reported.

Analysis:

Sample size calculation was performed.

Analysis was not adjusted for clustering, but justification was provided. "As our data stemmed from natural pre-school-bound clusters of children, we first determined the extent of clustering. Intraclass correlation coefficients (ICC) on the level of pre-schools were 0.016 and 0.014 for the primary outcomes of fruit intake and vegetable intake, respectively. With an average cluster size of 19.5 children per pre-school, the design effect (d = 1 + (average cluster size -1) x ICC) did not exceed 2, allowing us to ignore the issue of clustering in our analyses."

Notes	Sensitivity analysis - primary outcome: Fruit or vegetable intake is primary outcome.

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Randomly allocated to experimental group but the random sequence generation procedure is not described
Allocation concealment (selection bias)	Low risk	Preschool assignment was concealed through the use of sequentially-numbered, sealed envelopes.
Blinding of participants and personnel (performance bias) All outcomes	High risk	Outcome group: All/ Fruit & vegetable intake (parent self-reported survey) Due to the nature of the intervention, it was not possible to blind participants or intervention providers and this is likely to influence performance
Blinding of outcome assessment (detection bias) All outcomes	High risk	Fruit & vegetable intake (parent self-reported survey) Parents were not blinded to group allocation and therefore the risk of detection bias is high
Incomplete outcome data (attrition bias) All outcomes	High risk	Of 348 preschool children, 29.6% completed all 3 measurements, 51.4% 2 measurements and 19% 1 measurement, with 58% providing both pre- and post-intervention measurements
Selective reporting (reporting bias)	Unclear risk	There is no study protocol therefore it is unclear if there was selective outcome reporting
Other bias	Unclear risk	The design effect did not exceed 2 and so the authors ignored clustering in the analyses. The impact of this on the analyses is unclear

De Coen 2012

Methods	**Study design:** Cluster-randomised controlled trial

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De Coen 2012 *(Continued)*

Funding:

"The study was commissioned, financed and steered by the Ministry of the Flemish Community (Department of Economics, Science and Innovation; Department of Welfare, Public Health and Family)."

Participants	**Description:** Children attending pre-primary and primary schools from 6 communities in Flanders, Belgium **N (Randomised):** 31 schools, 1589 children **Age:** Mean: Intervention = 4.86 years, Control = 5.04 years **% Female:** Intervention = 47%, Control = 55% **SES and ethnicity:** % Of lower SES children: Intervention = 34%, Control = 29% **Inclusion/exclusion criteria:** Not specified **Recruitment:** "All pre-primary and primary schools in the six communities were invited to participate in the study." **Recruitment rate:** Child: 49% (1589/3242) School: 64% (31/49) **Region:** Flanders (Belgium)
Interventions	**Number of experimental conditions:** 2 **Number of participants (analysed):** Intervention = 396, Control = 298 **Description of intervention:** "The intervention was based on the 'Nutrition and Physical Activity Health Targets' of the Flemish Community clustered into: (i) increasing daily consumption of water and decreasing soft drinks consumption; (ii) increasing daily milk consumption; (iii) increasing daily consumption of vegetables and fruit; (iv) decreasing daily consumption of sweets and savoury snacks; and (v) increasing daily PA and decreasing screen-time behaviour." **The community** "Each intervention year, information brochures and posters regarding the five topics of the project were distributed through general practitioners, pharmacists, social services and at relevant community events by the regional health boards and the research team." **The schools**

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De Coen 2012 *(Continued)*

"All intervention schools were requested to (i) implement five Healthy Weeks per intervention year (one for each cluster of topics) with a minimum 1 h of classroom time dedicated to the topic together with extracurricular activities (e.g. during the vegetables and fruits week only fruits could be brought to school as a snack; schools organized fruit and vegetable tastings), (ii) evaluate and improve their playground and snack and beverage policy, and (iii) communicate with the parents on the programme and distribute materials to the parents. The intervention started with a meeting with the teachers during which they received manuals and guidelines and an implementation plan was discussed."

The parents

"The intervention materials for the parents were newly developed for the project. The parents received a poster visualizing the target messages and containing short tips regarding parenting practices and styles to encourage children to stick to the healthy eating and PA targets. Parents also received five letters, containing detailed information on the intervention topics and a website link with practical information such as tips and recipes. Based on the FFQ in the parental questionnaire, parents received a written, normative individual tailored advice on their child's consumption of water, milk, fruits, vegetables, soft drinks and sweet and savoury snacks, and their PA and screen-time behaviour."

The regional health boards

"They contacted each school at least twice per year assisting them in selecting relevant intervention materials and supervising the implementation progress."

Duration:

"The intervention was implemented over two school years (2008–2009 and 2009–2010) on different levels."

Number of contacts:

Unclear (multi-component)

Setting:

School

Modality:

Multiple (face-to-face, educational materials, resources (posters, brochures), letters)

Interventionist:

Multiple

Integrity:

"Process evaluation data revealed that all schools implemented the requested classroom hour. Regarding the snack and playground policy, it was clear that the requested adjustments asked for more time investment and at the time of observation, most schools did not yet meet up to the standard."

Date of study:

2008 to 2010

Description of control:

No information provided

Outcomes	**Outcome relating to children's fruit and vegetable consumption:** Child's consumption of fruits and vegetables (grams/day) assessed using a validated 24-item semi-quantitative food frequency questionnaire (FFQ) completed by parents **Outcome relating to absolute costs/cost effectiveness of interventions:**

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De Coen 2012 *(Continued)*

Not reported

Outcome relating to reported adverse events:

Not reported

Length of follow-up from baseline:

2 years

Length of follow-up post-intervention:

Immediately

Subgroup analyses:

None

Loss to follow-up:

Overall = 56% (not specified by group)

Analysis:

Did not adjust for clustering

Sample size calculation was performed

Notes	First reported outcome (fruit consumption grams/day) was extracted for inclusion in meta-analysis. The reported estimate did not account for clustering, therefore we used post-intervention data and calculated an effective sample size using ICC of 0.016 to enable inclusion in meta-analysis. Sensitivity analysis - primary outcome: Primary outcome not stated, fruit or vegetable intake 2nd listed outcome after BMI

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Randomly allocated to experimental group but the random sequence generation procedure is not described
Allocation concealment (selection bias)	Unclear risk	There is no information provided about allocation concealment and therefore it is unclear if allocation was concealed
Blinding of participants and personnel (performance bias) All outcomes	High risk	Outcome group: All/ Fruit and vegetable intake (self-reported) There is no blinding to group allocation of participants described and this is likely to influence performance
Blinding of outcome assessment (detection bias) All outcomes	High risk	Fruit and vegetable intake (self-reported) There is no mention that participants were blinded to group allocation and therefore the risk of detection bias is high
Incomplete outcome data (attrition bias) All outcomes	High risk	694/1589 (44%) completed 2-year assessment. Long-term attrition > 30% therefore at high risk of attrition bias
Selective reporting (reporting bias)	Unclear risk	There is no study protocol therefore it is unclear if there was selective outcome reporting

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De Coen 2012 *(Continued)*

Other bias	High risk	High risk of recruitment bias as communities were randomised and then schools within each community were invited to participate Unclear baseline imbalance as communities differed on nutrition and PA policy, raising awareness for these topics and health promotion expertise

de Droog 2014

Methods	**Study design:** Randomised controlled trial (as confirmed by the study author) **Funding:** *"Grant from The Netherlands Organisation for Scientific Research (NWO)."*
Participants	**Description:** Children aged 4-6 years from 6 primary schools in both urban and suburban districts in the Netherlands **N (Randomised):** 160 children **Age:** 4-6 years (no mean provided) **% Female:** 49% **SES and ethnicity:** No explicit data: “The sample consisted of various socioeconomic and cultural backgrounds.” **Inclusion/exclusion criteria:** “Only schools without formal fruit and vegetable programs were selected.” **Recruitment:** Not specified **Recruitment rate:** Unknown **Region:** Urban and suburban districts of the Netherlands
Interventions	**Number of experimental conditions:** 5 **Number of participants (analysed):** Interactive + congruent = 26 Interactive + incongruent = 26 Passive + congruent = 26 Passive + incongruent = 26

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de Droog 2014 *(Continued)*

Baseline group = 56

Description of intervention:

Children were read a picture book in a quiet room near their class. The picture book story described a main character rescuing his friend. The main character in this story is able to rescue his friend only after eating carrots to make him fit and strong.

Passive vs interactive

In the interactive sessions, the storyteller used a reading manual to ask children questions about the story and its characters before, during, and after the session. In the passive sessions, children were not asked any questions, but encouraged to sit quietly and listen.

Congruent vs incongruent

1 book featured a product–congruent character (a rabbit), and the other featured a product–incongruent character (a turtle)

Duration:

5 days

Number of contacts:

5 sessions

Setting:

School

Modality:

Face-to-face

Interventionist:

Female daycare worker

Integrity:

No information provided

Date of study:

October-December 2011

Description of control:

Baseline ‘control’ group “not exposed to the book”

Outcomes	**Outcome relating to children's fruit and vegetable consumption:** Child’s proportional consumption of vegetables. “Children’s proportional product consumption was measured by dividing the number of pieces of each food eaten by the total number of pieces of foods eaten, for example: number of carrots eaten/total number of foods eaten.” **Outcome relating to absolute costs/cost effectiveness of interventions:** Not reported **Outcome relating to reported adverse events:** Not reported **Length of follow-up from baseline:**

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de Droog 2014 *(Continued)*

	5 days **Length of follow-up post-intervention:** Immediately **Subgroup analyses:** None **Loss to follow-up:** There was no loss to follow-up **Analysis:** Unknown if sample size calculation was performed
Notes	"Children in the experimental groups were randomly assigned to the four experimental conditions (n = 26 per cell)" whereas the children in the baseline control group were not randomised. Therefore the study was classified as a comparative effectiveness trial and we did not consider the data from the baseline control group

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Randomly allocated to experimental group but the random sequence generation procedure is not described.
Allocation concealment (selection bias)	Unclear risk	There is no information provided about allocation concealment and therefore it is unclear if allocation was concealed.
Blinding of participants and personnel (performance bias) All outcomes	Low risk	Vegetable intake: Objective measure of child's vegetable intake and unlikely to be influenced by performance bias
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Vegetable intake The experimenter counted the number of pieces of each snack eaten and therefore given it is an objective measure unlikely to be influenced by detection bias
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	There is no information about attrition provided
Selective reporting (reporting bias)	Unclear risk	There is no study protocol therefore it is unclear if there was selective outcome reporting
Other bias	Low risk	Contamination bias that could threaten the internal validity is unlikely to be an issue

de Droog 2017

Methods	**Study design:** Randomised controlled trial

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de Droog 2017 *(Continued)*

	Funding: *"This work was supported by a grant from the Dutch Ministry of Health, Welfare and Sport (grant number: 201400117.014.013). The Ministry's sole role was funding, and, thus, was not involved in the design, data collection, data analyses, data interpretation, and writing of the report. None of the authors had a potential conflict of interest."*
Participants	**Description:** Children aged 2-3 years in nursery schools in Rotterdam, the Netherlands **N (Randomised):** 163 children **Age:** Mean = 2.63 years **% Female:** 48% **SES and ethnicity:** "The sample consisted of toddlers from mostly low-SES households with various cultural backgrounds." **Inclusion/exclusion criteria:** "Only schools without formal fruit and vegetables programs were selected" **Recruitment:** Not specified **Recruitment rate:** 99% (197/199) **Region:** The Netherlands
Interventions	**Number of experimental conditions:** 4 **Number of participants (analysed):** Passive with puppet: 36 Passive without puppet: 40 Interactive with puppet: 41 Interactive without puppet: 37 **Description of intervention:** Children were read a picture book "Rabbit's brave rescue". The embedded message in the book was that "eating carrots makes you strong". Reading sessions were conducted in a quiet room within the nursery school during one workweek. The reading sessions were being held in small groups of 3-5 toddlers, and took about 10 minutes. Reading was performed either with or without a hand puppet (hand puppets were developed that resembled the physical appearance of the main character in the picture book, 'Rabbit'). Children allocated to the passive groups (with or without a puppet) were not asked questions during reading time and children allocated to the interactive groups (with or without a puppet) were asked questions during reading time.

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de Droog 2017 *(Continued)*

Duration:

4 days

Number of contacts:

4 reading sessions (1 per day)

Setting:

Preschool

Modality:

Face-to-face

Interventionist:

Women with pedagogical education

Integrity:

The reading sessions were monitored.

Date of study:

Recruited in February and March 2015

Description of control:

N/A

Outcomes	**Outcome relating to children's fruit and vegetable consumption:** Consumption of carrots (proportion): “The proportion of consumed carrots was calculated by dividing the pieces of carrots the child had eaten by the total number of pieces of foods the child had eaten.” “Proportional scores were used, rather than absolute scores, because the proportional scores take into account the total amount of foods eaten.” **Outcome relating to absolute costs/cost-effectiveness of interventions:** Not reported **Outcome relating to reported adverse events:** Not reported **Length of follow-up from baseline:** 4 days **Length of follow-up post-intervention:** Immediately **Subgroup analyses:** None **Loss to follow-up:** “Children who were absent on the last reading day (n = 34), were excluded from the analyses.” “The total drop-out was evenly spread across conditions.” Overall: 17% (not specified by group)

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de Droog 2017 *(Continued)*

	Analysis: Unknown if sample size calculation was performed.
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	"On the first day, the storytellers picked up the children from class in order of the name list provided by the school, and randomly assigned them to one of the four reading conditions, ensuring balance in gender." No mention of how the randomisation sequence was generated.
Allocation concealment (selection bias)	High risk	The allocation was done by the person delivering the intervention.
Blinding of participants and personnel (performance bias) All outcomes	Low risk	"For the reading sessions, four women with a pedagogical education were recruited and trained to perform all the different reading styles and puppetry conditions. These storytellers were teamed up with four female experimenters who observed the toddlers during the readings. With each team being allocated to a specific day of the week, all the toddlers in the study were exposed to all the storytellers and observers." Those delivering the intervention were aware of group allocation, however this is unlikely to have impacted the outcomes.
Blinding of outcome assessment (detection bias) All outcomes	Low risk	"The experimenter conducting the eating task was blinded to group assignment, because the reading sessions and eating tasks took place in different rooms."
Incomplete outcome data (attrition bias) All outcomes	High risk	Dropouts were 23% at short-term follow-up (in text). However in Consort flowchart, it appears that people were excluded prior to randomisation. In the text it says that most were excluded due to not attending on the final measurement day. This sounds like the dropouts should be removed at the analysis/data collection stage.
Selective reporting (reporting bias)	Low risk	All outcomes are reported as pre-specified in the trial registration.
Other bias	Low risk	No other sources of bias identified

de Wild 2013

Methods	**Study design:** Randomised controlled trial – cross-over **Funding:** *"European Community's Seventh Framework Programme (FP7/2007-2013) under the Grant agreement No. 245012-HabEat."*
Participants	**Description:** Preschool-aged children recruited from 3 daycare centres in Wageningen, the Netherland

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de Wild 2013 *(Continued)*

	N (Randomised): 40 children **Age:** 21 to 46 months (mean = 36 months) **% Female:** 50% **SES and ethnicity:** Not specified **Inclusion/exclusion criteria:** Inclusion criteria: "Inclusion into the study required presence of the child at the day care-centre for at least 2 days per week." Exclusion criteria. "Participants were screened for food allergies and health problems (as reported by the parents)" **Recruitment:** "A total of 40 healthy children aged 2–4 years were recruited from 2 day care-centres in Wageningen, The Netherlands. Participation was voluntary and parents and day care-centres were thoroughly informed about the study. Written parental consent was given for the participating children." **Recruitment rate:** Unknown **Region:** Wageningen (The Netherlands)
Interventions	**Number of experimental conditions:** 2 **Number of participants (analysed):** Spinach high-energy/endive low-energy = 15 Endive high-energy/spinach low-energy = 13 **Description of intervention:** "During the intervention period, half of the participants (n = 20) received vegetable soup flavour A low in energy content (LE) consistently paired with vegetable soup flavour B high in energy content (HE), whereas the other half of the participants received the reverse (i.e. flavour A HE + flavour B LE)." **Duration:** 7 weeks **Number of contacts:** 14 exposures (twice/week) **Setting:** Preschool **Modality:** Face-to-face

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de Wild 2013 *(Continued)*

	Interventionist: Daycare leaders **Integrity:** No information provided **Date of study:** Unknown **Description of control:** N/A
Outcomes	**Outcome relating to children's fruit and vegetable consumption:** As-desired consumption of vegetable soup (grams). "Consumption was measured by pre- and post-weighing on a digital scale with a precision of 0.1 g." **Outcome relating to absolute costs/cost effectiveness of interventions:** Not reported **Outcome relating to reported adverse events:** Not reported **Length of follow-up from baseline:** 8 weeks and 4 and 8 months **Length of follow-up post-intervention:** 1 week and at 2 and 6 months **Subgroup analyses:** None **Loss to follow-up (at 2 and 6 months):** Overall: 32%, 39% (not specified by group) **Analysis:** Sample size calculation was performed.
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Randomly allocated to experimental group but the random sequence generation procedure is not described
Allocation concealment (selection bias)	Unclear risk	There is no information provided about allocation concealment and therefore it is unclear if allocation was concealed
Blinding of participants and personnel (performance bias)	Low risk	Vegetable intake (objective):

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de Wild 2013 *(Continued)*

All outcomes		The children and the daycare leaders were blinded to the treatment, i.e. they were unaware which product was high or low in energy and therefore low risk of performance bias
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Vegetable intake (objective): Outcome was pre-post weight of soup bowl assessed by researcher. Researchers were not blinded to group allocation (as they served the soup (2 x green soups varying in energy intake)) and researcher was not present in room during consumption of soup
Incomplete outcome data (attrition bias) All outcomes	High risk	Of 40 eligible children, 12 were excluded from data analysis due to low intake levels during the conditioning period. Of 28 children 17 (61%) completed the 6-month follow-up
Selective reporting (reporting bias)	Low risk	The primary outcomes reported in the paper align with those specified in the trial registration
Other bias	Low risk	Contamination bias that could threaten the internal validity is unlikely to be an issue

de Wild 2015a

Methods	**Study design:** Randomised controlled trial **Funding:** *"European Community's Seventh Framework Programme (FP7/2007-2013) under the Grant agreement No. 245012-HabEat."*
Participants	**Description:** Preschool-aged children recruited from 3 daycare centres in Wageningen, the Netherlands **N (Randomised):** 75 children **Age:** 1.9-5.9 years (mean = 3.7 years) **% Female:** 50% **SES and ethnicity:** Not specified **Inclusion/exclusion criteria:** No explicit inclusion/exclusion criteria. "Participants were screened for food allergies and health problems (as reported by the parents)" **Recruitment:**

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de Wild 2015a *(Continued)*

	"Parents with children in the targeted age range received an information letter and an invitation to register their child(ren) for participation via the day-cares. Participation was voluntary and parents and day care-centres were thoroughly informed about the study." **Recruitment rate:** Unknown **Region:** Wageningen (The Netherlands)
Interventions	**Number of experimental conditions:** 2 **Number of participants (analysed):** Choice condition = 34 No-choice condition = 36 **Description of intervention:** "Each child was exposed 12 times to six familiar target vegetables at home during dinner, which is the traditional hot meal including vegetables in The Netherlands….the choice group received two types of vegetables from which to choose, or they could choose to eat both vegetables during the meal." **Duration:** 12 days **Number of contacts:** 12 **Setting:** Home **Modality:** Face-to-face **Interventionist:** Parents **Integrity:** No information provided **Date of study:** Unknown **Description of control:** "The no-choice group received only one type of vegetable per dinner session"
Outcomes	**Outcome relating to children's fruit and vegetable consumption:** "The main outcome of the study was the children's intake (in gram) of the vegetables. Vegetable intake was measured by weighing their plates before and after dinner (left overs)." **Outcome relating to absolute costs/cost effectiveness of interventions:** Not reported

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de Wild 2015a *(Continued)*

Outcome relating to reported adverse events:

Not reported

Length of follow-up from baseline:

12 days

Length of follow-up post-intervention:

Immediately

Subgroup analyses:

None

Loss to follow-up:

Overall = 6% (not specified by group)

Analysis:

Sample size calculation was performed

Notes

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Randomly allocated to experimental group but the random sequence generation procedure is not described
Allocation concealment (selection bias)	Unclear risk	There is no information provided about allocation concealment and therefore it is unclear if allocation was concealed
Blinding of participants and personnel (performance bias) All outcomes	Low risk	Vegetable intake (objective measure): Children's vegetable intake was measured by weighing their plates before and after dinner (left-overs). There is a low risk of performance bias
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Vegetable intake (objective measure): Children's vegetable intake was measured by weighing their plates before and after dinner (left-overs). There is a low risk of detection bias
Incomplete outcome data (attrition bias) All outcomes	Low risk	70/75 (93%) children completed the study and therefore risk of attrition bias is low
Selective reporting (reporting bias)	Unclear risk	The primary outcomes reported in the paper align with those specified in the trial registration. However in the trial registration the food diary is listed as a secondary outcome but the results are not reported in the outcome paper
Other bias	Low risk	Contamination bias that could threaten the internal validity is unlikely to be an issue

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de Wild 2015b

Methods	**Study design:** Randomised controlled trial – semi-cross-over **Funding:** *"European Community's Seventh Framework Programme (FP7/2007-2013) under the Grant agreement No. 245012-HabEat."*
Participants	**Description:** Preschool-aged children recruited from 2 daycare centres in Wageningen, the Netherland **N (Randomised):** 45 children **Age:** 18-45 months (mean = 32.6 months) **% Female:** 49% **SES and ethnicity:** Not specified **Inclusion/exclusion criteria:** No explicit inclusion/exclusion criteria. "Participants were screened for food allergies and health problems (as reported by the parents)" **Recruitment:** "recruited from two day-care centres in Wageningen, the Netherlands. Parents signed an informed consent for their child's participation." **Recruitment rate:** Unknown **Region:** Wageningen (The Netherlands)
Interventions	**Number of experimental conditions:** 2 **Number of participants (analysed):** Parsnip crisps-tomato ketchup/red beet crisps-white sauce = 19 Red beets crisps-tomato ketchup/parsnip crisps-white sauce = 20 **Description of intervention:** "Half of the participants received red beet crisps combined with tomato ketchup (TK [C]) consistently paired with parsnip crisps combined with white sauce (WS [UC]). The other half of the participants received the reverse, i.e. red beet crisps + WS(UC) and parsnip crisps + TK(C)." **Duration:** 7 weeks **Number of contacts:**

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de Wild 2015b *(Continued)*

	14 exposures (twice/week) **Setting:** Preschool **Modality:** Face-to-face **Interventionist:** Daycare leaders **Integrity:** No information provided **Date of study:** Unknown **Description of control:** N/A
Outcomes	**Outcome relating to children's fruit and vegetable consumption:** As-desired consumption of vegetable crisps (grams). “Consumption of crisps and dip sauces were measured by pre- and post-weighing on a digital scale with a precision of 0.1 g.” **Outcome relating to absolute costs/cost effectiveness of interventions:** Not reported **Outcome relating to reported adverse events:** Not reported **Length of follow-up from baseline:** Post-test 1: 9 weeks Post-test 2: 4 months (2 months after conditioning) Post-test 3: 8 months (6 months after conditioning) **Length of follow-up post-intervention:** Post-test 1: immediate Post-test 2: 2 months Post-test 3: 6 months after conditioning **Subgroup analyses:** None **Loss to follow-up (at 2 and 6 months):** Overall: 5%, 33% (not specified by group) **Analysis:** Unknown if sample size calculation was performed

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de Wild 2015b *(Continued)*

Notes

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Randomly allocated to experimental group but the random sequence generation procedure is not described
Allocation concealment (selection bias)	Unclear risk	There is no information provided about allocation concealment and therefore it is unclear if allocation was concealed
Blinding of participants and personnel (performance bias) All outcomes	Low risk	Vegetable crisps intake (objective): The children were not aware that their intake was measured or which condition they participated in and so the risk of performance bias is low
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Vegetable crisps intake (objective): The outcome was vegetable chip and dip intake (each assessed separately) by weighing amount before and after consumption. It is not clear who (i.e. researchers or daycare centre staff) weighed the chips & dip, and whether or not they were blinded. Blinding of outcome assessors unlikely to influence outcome
Incomplete outcome data (attrition bias) All outcomes	High risk	Of the 45 children, 6 were excluded because they had no intake at all of the dip sauces. Of the remaining 39 children, 26 (67%) completed the 6-month follow-up. The risk of attrition bias is high
Selective reporting (reporting bias)	Unclear risk	The trial registration reports a secondary outcome that is not reported in the outcome paper
Other bias	Low risk	Contamination bias that could threaten the internal validity is unlikely to be an issue

de Wild 2017

Methods	**Study design:** Randomised controlled trial **Funding:** *"The research leading to the results presented here received funding from the European Community's Seventh Framework Programme (FP7/2007-2013) under grant agreement no. 245012-HabEat."*
Participants	**Description:** Children aged 2-4 years in 6 day-care centres in Wageningen, the Netherlands **N (Randomised):** 103 children **Age:** Plain spinach (mean): 34.5 months Creamed spinach (mean): 36.1 months

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de Wild 2017 *(Continued)*

Spinach ravioli (mean): 35.4 months

Green beans (mean): 35.8 months

% Female:

Plain spinach: 50%

Creamed spinach: 52%

Spinach ravioli: 46%

Green beans: 42%

SES and ethnicity:

Not specified

Inclusion/exclusion criteria:

No explicit inclusion/exclusion criteria stated for this trial, "Participants were screened for food allergies and health problems (as reported by the parents)."

Recruitment:

Not specified, recruited from 6 child care centres

Recruitment rate:

99% (103/104)

Region:

Wageningen (the Netherlands)

Interventions

Number of experimental conditions: 4

Number of participants (analysed):

Plain spinach: 26

Creamed spinach: 25

Spinach ravioli: 26

Green beans: 26

Description of intervention:

"Families received a weekly vegetable parcel, including their vegetable product for one meal (main meal), cooking instructions, and a food diary. A standardized weighing scale with a precision of 1 g (Fiesta; Soehnle) was supplied to all participating families together with the first delivery of the vegetable parcel."

Duration:

6 weeks

Number of contacts:

6 (once per week)

Setting:

Home

Modality:

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de Wild 2017 *(Continued)*

	Face-to-face **Interventionist:** Parents **Integrity:** No information provided **Date of study:** The study was conducted between September 2014 and January 2015 **Description of control:** N/A
Outcomes	**Outcome relating to children's fruit and vegetable consumption:** As-desired intake of plain cooked spinach (grams): "Spinach intake was measured by weighing the bowls before and after lunch (leftovers) on a digital scale with a precision of 0.1 g." **Outcome relating to absolute costs/cost-effectiveness of interventions:** Not reported **Outcome relating to reported adverse events:** Not reported **Length of follow-up from baseline:** 7 weeks **Length of follow-up post-intervention:** 1 week **Subgroup analyses:** None **Loss to follow-up:** "There were no lost to follow up or withdrawals" **Analysis:** Sample size calculations performed
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	"Children were randomly assigned to one of the four groups using a four-block design: green beans (control), plain spinach (pure spinach), creamed spinach (diluted), and spinach ravioli (hidden). Randomization was done by a person who was not involved in study recruitment, enrollment, or assignment of participants."

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de Wild 2017 *(Continued)*

		No mention of how the randomisation sequence was generated
Allocation concealment (selection bias)	Unclear risk	There is no mention of allocation concealment.
Blinding of participants and personnel (performance bias) All outcomes	High risk	Outcome group primary outcomes – preference and intake “Day-care center staff members were instructed to behave as they usually did and not to alter their daily routine. The researchers were absent while children ate their spinach at lunch, to not disturb the normal daily lunch routine.” It is unclear whether the day-care centre staff or researchers were blind to experimental group allocation. Outcome group: secondary outcomes – intake and liking "The products in the plain spinach, creamed spinach, and green beans groups were commercially available (frozen green beans [2.5 kg], frozen chopped spinach [2.5 kg], and frozen spinach a la crème [1 kg]) and were repacked in family portions and delivered frozen via the day-care centers on a weekly basis.” It is likely parents knew their experimental group allocation and this could have affected the outcome.
Blinding of outcome assessment (detection bias) All outcomes	High risk	Outcome group primary outcomes – preference and intake “Spinach intake was measured by weighing the bowls before and after lunch (leftovers) on a digital scale with a precision of 0.1 g (model S-4001; Denver Instruments, and model Kern-572; Kern & Sohn).” It is unclear whether the researchers were blind to group allocation, how the outcome assessment procedure is unlikely to have been impacted. Outcome group: secondary outcomes – intake and liking “Parents weighed the child’s vegetable portion before and after the meal to determine vegetable intake.” “After the main meal, parents completed a food diary, in which information was collected; for example, on deviations from the described procedures, dinnertime, consumption of other meal components, the child’s health status, and the child’s liking of the vegetables (parent’s perception and rated on a 9-point scale (where 1= extremely disgusting and 9= extremely delicious).” All outcome data was collected by the parents themselves – self-report
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	There were 10 children who had only 1 or 2 data points for intake of the 6 meals, with no reasons reported. Not enough information reported about the reasons for missing data.
Selective reporting (reporting bias)	Low risk	All outcomes are reported as pre-specified in the trial registration.
Other bias	Low risk	No other sources of bias were identified.

Duncanson 2013

Methods	**Study design:**

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Duncanson 2013 *(Continued)*

Randomised controlled trial

Funding:

"C Collins is supported by a National Health and Medical Research Council Australian Career Development Research Fellowship (#6315005). K Duncanson is supported by a Clinical Education and Training Institute Rural Research Capacity Building Program Grant and New Staff Research Grant (University of Newcastle)."

Participants	**Description:** Parents of children aged 2 to 5 years living in a rural area of New South Wales, Australia **N (Randomised):** 146 parents **Age:** Children (mean): Intervention = 4.0 years, Control = 4.0 years Parents: Younger than 30 years: Intervention = 34%, Control = 17% 30 years or older: Intervention = 66%, Control = 83% **% Female:** Child: Intervention = 47%, Control = 48% Parent: Intervention = 100%, Control = 99% **SES and ethnicity:** Parent education: Secondary = 46%, Tertiary = 55% Aboriginal: Child = 4%, Parent = 2% **Inclusion/exclusion criteria:** Inclusion criteria: "Inclusion criteria were eldest child in family ages 2 to 5 years, without a chronic health condition that affected dietary intake." Exclusion criteria: "A child was excluded if he or she had a chronic disease, such as coeliac disease or a food allergy that has a significant effect on dietary intake. The eldest child within the eligible age range was selected as the study child for consistency and simplicity." Kids were also excluded if they began primary school **Recruitment:** "parents of young children were recruited from child care facilities in 5 rural, low socioeconomic localities in NSW, Australia." **Recruitment rate:** Parent: 81% (146/180) **Region:** New South Wales (Australia)
Interventions	**Number of experimental conditions:** 2 **Number of participants (analysed):**

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Duncanson 2013 *(Continued)*

Intervention = 45, Control = 43

Description of intervention:

"The intervention involved dissemination of the Tummy Rumbles interactive CD (16) and the Raising Children DVD (17) at baseline in September 2009, accompanied by written instructions for optimal use. The only prompt provided to parents to use the resources was a reminder note delivered by post with the 3-month follow-up surveys. To simulate population-level resource dissemination, further prompting of parents was not conducted."

"The tummy rumbles interactive nutrition education CD is a self-directed resource for childcare staff and parents, Raising children is a guide to parenting from birth to 5"

Duration:

12 months

Number of contacts:

DVD and CD played at parents' leisure, 1 contact from researchers at 3 months by phone

Setting:

Home

Modality:

DVD/CD

Interventionist:

N/A (provision of DVD)

Integrity:

"Intervention group participants were considered to have adhered to the study protocol if they reported using both Tummy Rumbles and Raising Children for at least 1 hour each during the intervention period."

Date of study:

September 2009 to September 2010

Description of control:

Wait-list control,"

A generic nutrition brochure and the Active Alphabet physical activity resource were distributed to the control group to simulate real-life exposure to control resources and facilitate retention and blinding of the control group. Tummy Rumbles and Raising Children were provided to the control group at trial completion."

Outcomes

Outcome relating to children's fruit and vegetable consumption:

Child's consumption of fruits and vegetables (servings) assessed using a semi-quantitative food frequency questionnaire (FFQ), the Australian Toddler Eating Survey (ATES) completed by parents

Outcome relating to absolute costs/cost effectiveness of interventions:

Not reported

Outcome relating to reported adverse events:

Not reported

Length of follow-up from baseline:

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Duncanson 2013 *(Continued)*

	3 and 12 months **Length of follow-up post-intervention:** Immediately **Subgroup analyses:** None **Loss to follow-up (at 3 and 12 months):** Intervention = 17%, 40% Control = 24%, 39% **Analysis:** Sample size calculation was performed.
Notes	First reported outcome (serves fruit/day) at 3-month follow-up was for inclusion in the short-term meta-analysis and 12 month follow-up for the ≥ 12 months meta-analysis. Additional data were provided by the author to allow pooling in meta-analysis Sensitivity analysis - primary outcome: Primary outcome not stated, power calculation conducted fruit or vegetable intake

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	The random sequence was created by computer-generated random numbers
Allocation concealment (selection bias)	Low risk	Allocation was concealed given that sequentially-numbered unopened returned baseline survey envelopes were matched with computer-generated random numbers
Blinding of participants and personnel (performance bias) All outcomes	Low risk	Participants were blinded to group allocation throughout the trial
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Participants were blinded to group allocation throughout the trial. The protocol indicates that assessors of the main outcome measures were blinded to participant group allocation
Incomplete outcome data (attrition bias) All outcomes	High risk	Short-term attrition was 21% and long-term attrition was 40%. No imputation of missing data was carried out
Selective reporting (reporting bias)	Low risk	The primary outcomes published in the protocol align with the results reported in the outcomes paper
Other bias	Low risk	Contamination bias that could threaten the internal validity is unlikely to be an issue

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Farrow 2019

Methods	**Study design:** Randomised controlled trial **Funding:** *"British Psychological Society and Aston University."*
Participants	**Description:** Children aged 3-6 years old attending preschools and primary schools in the West Midlands, UK **N (Randomised):** 74 children **Age:** Child (mean) intervention (Vegetable Maths Masters) = 4.4, control (Turtle Maths) = 4.3 years of age **% Female:** Child: 50% **SES and ethnicity:** Not specified **Inclusion/exclusion criteria:** Inclusion criteria:*"In order to participate in the study children needed to be able to read, write and/or speak in English."* No explicit exclusion criteria*: "Parents and teachers/child caregivers were asked to indicate if any children had allergies to the study foods."* **Recruitment:** *"Children were recruited from preschools and primary schools in the West Midlands, UK."* **Recruitment rate:** Unknown **Region:** West Midlands (UK)
Interventions	**Number of experimental conditions:** 2 **Number of participants (analysed):** Intervention (Vegetable Maths Masters) = 40, control (Turtle Maths) = 34 **Description of intervention:** Children played with the Vegetable Maths Masters app which consisted of maths games with real images of vegetables (sweetcorn and carrot) **Duration:** 1 day **Number of contacts:** 1

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Farrow 2019 *(Continued)*

	Setting: Preschool + primary school **Modality:** Multiple (app game on tablet, face-to-face) **Interventionist:** Researcher **Integrity:** No information provided **Date of study:** Unknown **Description of control:** Children played with a different maths app called 'Turtle Maths' which did not include images of food, but utilised similar counting and adding maths games
Outcomes	**Outcome relating to children's fruit and vegetable consumption:** Child's consumption of vegetables (grams).*"All foods were presented in pre-cut standardised bite sized pieces in small bowls and the researcher recorded how many pieces children had eaten (pieces were standardised in size and had been pre-weighed using Salter digital scales)."* **Outcome relating to absolute costs/cost-effectiveness of interventions:** Not reported **Outcome relating to reported adverse events:** Not reported **Length of follow-up from baseline:** < 1 day **Length of follow-up post-intervention:** Same day **Subgroup analyses:** None **Loss to follow-up (at same day)** No loss to follow-up **Analysis:** Sample size calculation was performed
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement

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Farrow 2019 *(Continued)*

Random sequence generation (selection bias)	Unclear risk	"Children were randomly allocated sequentially to one of two conditions". Assigned as recruited, unclear what methods used, however no further detail
Allocation concealment (selection bias)	Unclear risk	Not enough information
Blinding of participants and personnel (performance bias) All outcomes	Low risk	Personnel and participants not blinded but objective measure of child's vegetable intake and unlikely to be influenced by performance bias
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Researcher not blinded, objective outcome - grams (pieces) consumed. Unclear if weighed leftovers or if counted pieces. Either way unlikely to influence detection bias
Incomplete outcome data (attrition bias) All outcomes	Low risk	No loss to follow-up, very low risk of bias
Selective reporting (reporting bias)	Unclear risk	No protocol, trial registration
Other bias	Low risk	Contamination bias: children then played their game individually on a tablet in a quiet area near to, or in, their usual classroom or play area for 10 min. Unlikely the control group received the intervention game

Fildes 2014

Methods	**Study design:** Randomised controlled trial **Funding:** *"The recruitment of the Gemini cohort was funded by a grant from Cancer Research UK (no. C1418/A7974), and the design and production of the packs used in this study was funded by Weight Concern (registered charity no. 1059686)."*
Participants	**Description:** Families with 3- to 4-year-old children from a larger cohort study (the Gemini study) **N (Randomised):** 1006 families **Age:** Child (mean): Intervention = 3.9 years, Control = 3.8 years Parent (mean): Intervention = 38.0 years, Control = 37.3 years **% Female:** Child: Intervention = 49%, Control = 50% Parent: not specified **SES and ethnicity:**

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Fildes 2014 *(Continued)*

Maternal education (below university level): intervention 49%, control = 49%

Inclusion/exclusion criteria:

Not specified

Recruitment:

"Participants were families with 3- to 4-year-old children from the Gemini study, a cohort of 2,402 families with twins born during 2007 in England and Wales. Currently active families (n=2,321) were sent information about a study to test a method of increasing children's acceptance of vegetables"

Recruitment rate:

Families: 43% (1006/2321)

Region:

England and Wales

Interventions

Number of experimental conditions: 2

Number of participants (analysed):

Intervention = 98, Control = 123

Description of intervention:

"The intervention pack contained an exposure instruction leaflet, progress charts, and stickers. The exposure instructions asked parents to offer the child a single very small piece of their target vegetable every day for 14 days, allowing the child to choose a sticker as a reward if they tried it. They were asked to do this separately with each child and outside mealtimes."

Duration:

14 days

Number of contacts:

14

Setting:

Home

Modality:

Face-to-face

Interventionist:

Parents

Integrity:

"Among the 175 returned (89%), the mean number of exposure sessions was 13.8 (range=11 to 14), and children tasted their target vegetables a mean of 12.4 times (range=0 to 14). Children complied with the intervention by trying their target vegetable on an average of 90% (range 0% to 100%) of the exposure days during the experiment phase."

Date of study:

Unknown

Description of control:

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Fildes 2014 *(Continued)*

	Received no intervention, "Control families were sent the intervention materials on completion of the study."
Outcomes	**Outcome relating to children's fruit and vegetable consumption:** Child's intake of the target vegetable (number of pieces). Parents "recorded the number of pieces (including half-pieces) of vegetable the child ate; this comprised the intake measure." **Outcome relating to absolute costs/cost effectiveness of interventions:** Not reported **Outcome relating to reported adverse events:** Not reported **Length of follow-up from baseline:** 14 days **Length of follow-up post-intervention:** Immediately **Subgroup analyses:** None **Loss to follow-up:** Intervention = 68% Control = 68% **Analysis:** Unknown if sample size calculation was performed
Notes	Mean and SEM were estimated from a study figure using an online resource (Plot Digitizer: plotdigitizer.sourceforge.net) for intervention and control groups at the end of the experimental phase (T3). Sensitivity analysis - primary outcome: Fruit or vegetable intake is listed as primary outcome

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Randomly allocated to experimental group but the random sequence generation procedure is not described
Allocation concealment (selection bias)	Unclear risk	There is no information provided about allocation concealment and therefore it is unclear if allocation was concealed
Blinding of participants and personnel (performance bias) All outcomes	High risk	Vegetable intake: There is no mention that the parents were blinded and they were cutting and offering the pieces to the child and this could have influenced performance
Blinding of outcome assessment (detection bias) All outcomes	High risk	Vegetable intake: There is no mention that the parents were blinded and they were cutting and offering the pieces to the child and so at high risk of detection bias

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Fildes 2014 *(Continued)*

Incomplete outcome data (attrition bias) All outcomes	High risk	472 (47%) out of the 1006 randomised returned the outcome data sheets and therefore high risk of attrition bias
Selective reporting (reporting bias)	Unclear risk	There are secondary outcomes reported in the trial registration that are not presented in the outcomes paper
Other bias	Low risk	Contamination bias that could threaten the internal validity is unlikely to be an issue

Fildes 2015

Methods	**Study design:** Randomised controlled trial **Funding:** *"This research is supported by European Community's Seventh Framework Programme (FP7/2007-2013) under the grant agreement no. 245012-HabEat. The purees offered to participants in this study and the artichoke and peach purees used as a test food were donated by Danone Nutricia Research."*
Participants	**Description:** Mothers and their 4- to 6-month-old infants in the UK, Greece and Portugal **N (Randomised):** 146 parent-infant dyads **Age:** Infant (mean): Intervention = 39.0 weeks, Control = 38.9 weeks Mother (mean, at child's birth): Intervention = 33.0 years, Control = 32.7 years **% Female:** Infant: 52% **SES and ethnicity:** Education (below university) = 27% **Inclusion/exclusion criteria:** "Mothers were eligible to participate if they were over 18 years old at recruitment, they were sufficiently proficient in each country's respective native language to understand the study materials and their infant was born after 37 weeks' gestation, without diagnosed feeding problems." **Recruitment:** "Women in the final trimester of their pregnancy and mothers of infants aged less than 6 months were recruited from antenatal clinics (n 327), primary care, paediatricians and hospitals in London (UK), Athens (Greece) and Porto (Portugal) to a larger study exploring children's fruit and vegetable acceptance during weaning." **Recruitment rate:** Mothers: 45% (146/327) **Region:**

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Fildes 2015 *(Continued)*

	London (UK), Athens (Greece) and Porto (Portugal)
Interventions	**Number of experimental conditions:** 2 **Number of participants (analysed):** Intervention = 71, Control = 68 **Description of intervention:** "In the intervention group, a researcher or health professional explained to the participant: (1) the importance of introducing vegetables early in the weaning process, (2) the beneficial effects of offering different single vegetables each day, (3) the techniques of exposure feeding, (4) interpreting infants' facial reactions to food and (5) the need for persistence when an infant initially rejects a food. "five vegetables were selected as the first foods to be introduced. They were asked to offer the five vegetables in a sequence over 15 d as follows: A,B,C,D,E, A,B,C,D,E, A,B,C,D,E and to record progress on a chart provided. For a further 5 d, participants were told to continue to offer vegetables, but in addition, to start to introduce additional age-appropriate foods." **Duration:** 20 days (15 days exposure, 5 days veg plus other foods) **Number of contacts:** 20 (15 veg feeding exposures, 5 veg plus other food exposures) **Setting:** Home or health facility **Modality:** Face-to-face + leaflet **Interventionist:** Parent **Integrity:** "Completed intervention charts were returned by 86% of intervention families (UK; 100 % (28/28), Greece; 100 % (16/16), Portugal; 63% (17/27)). Completed charts revealed that over the 15-d intervention period, parents recorded their infants consuming vegetables on 89% (mean 13·3 (SD 3·0)) of the fifteen possible eating occasions." **Date of study:** February 2011 and July 2012 **Description of control:** Received no intervention, 'usual care'
Outcomes	**Outcome relating to children's fruit and vegetable consumption:** Infant consumption of fruits and vegetables (grams). The contents of the jars of fruit and vegetable puree were weighed prior to and following the taste test to calculate the weight of food consumed. **Outcome relating to absolute costs/cost effectiveness of interventions:** Not reported **Outcome relating to reported adverse events:**

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Fildes 2015 *(Continued)*

	Not reported **Length of follow-up from baseline:** 1 month **Length of follow-up post-intervention:** 2 weeks **Subgroup analyses:** None **Loss to follow-up:** Intervention = 5% Control = 4% **Analysis:** Sample size calculation was performed.
Notes	First reported outcome (vegetable intake) was extracted for inclusion in meta-analysis. Sensitivity analysis - primary outcome: Fruit or vegetable intake is primary outcome

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Randomised to experimental group using a block randomisation matrix created by an independent statistician
Allocation concealment (selection bias)	Unclear risk	Allocation was revealed to the researcher, but unclear how or when
Blinding of participants and personnel (performance bias) All outcomes	High risk	Infant's consumption of novel vegetable: Mothers offered and fed the vegetable to infants. Given the nature of the intervention, parents in the intervention arm were not blinded and therefore this could have influenced performance
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Infant's consumption of novel vegetable: The outcome was weighed, but it is not clear who weighed the food (mother who fed the child, or researcher who observed the mother feeding the child). The researcher who was present during outcome assessment was the same researcher who delivered the intervention to the mother. The impact on detection bias is unclear
Incomplete outcome data (attrition bias) All outcomes	Low risk	139/146 (95%) completed the follow-up and therefore low risk of attrition bias
Selective reporting (reporting bias)	Unclear risk	There is no study protocol therefore it is unclear if there was selective outcome reporting
Other bias	Low risk	Contamination bias that could threaten the internal validity is unlikely to be an issue

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Fisher 2012

Methods	**Study design:** Cluster-randomised controlled trial **Funding:** *"This work was funded by an investigator-initiated grant to J.O.F. from the Clorox Company, which owns the Hidden Valley, The Original Ranch brand of dressing used in this research. The authors attest to having full scholarly authority over this work and responsibility for the research design and methods, the integrity of the data, the analyses, and the interpretation of the findings."*
Participants	**Description:** Preschool-aged children in Head Start classrooms and their parent **N (Randomised):** 155 parent-child dyads **Age:** Child: 3 to 5 years (mean = 4 years) Parent: not specified **% Female:** Child: 48% Parent: not specified **SES and ethnicity:** "predominately Hispanic (88%) children" "Of participating parents, close to a majority (n=89) reported being married and slightly greater than one-third (n=51) reported schooling beyond high school." **Inclusion/exclusion criteria:** No explicit inclusion criteria stated for this trial Exclusion criteria: "Exclusion criteria included severe food allergies and/or other medical conditions (e.g., diabetes) that might influence the ability to participate in an as-desired snack and absences at 75% or more of the vegetable exposure trials." **Recruitment:** "To achieve a target sample size of 37 children per experimental dip condition, eight preschool classrooms within three Head Start Centers were approached to participate. Parents of 166 children were sent letters to request written consent for their own and their child's participation in the study." **Recruitment rate:** Parent-child dyads = 93% (155/166) **Region:** Houston, TX (USA)
Interventions	**Number of experimental conditions:** 4 **Number of participants (analysed):**

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Fisher 2012 *(Continued)*

Plain = 39, Regular = 39, Light = 36, Sauce = 38

142 parents (not specified by group)

Description of intervention:

"At each trial, raw broccoli was presented with 2% milk (8 oz [246 g]) to children in the condition to which they were assigned. Children were instructed to eat as much or as little as desired."

Plain: "broccoli was served without dressing."

Regular: "broccoli was served with 2.5 oz of a regular ranch-flavored salad dressing."

Light: "broccoli was served with 2.5 oz of a reduced-energy/fat ranch-flavored salad dressing."

Sauce: "2.5 oz of the regular dressing was mixed together with broccoli as a sauce"

Duration:

7 weeks

Number of contacts:

"Thirteen exposure trials (twice per week) took place in children's classrooms across a 7-week period."

Setting:

Preschool

Modality:

Face-to-face

Interventionist:

Trained research staff

Integrity:

No information provided

Date of study:

2008

Description of control:

N/A

Outcomes	**Outcome relating to children's fruit and vegetable consumption:** Child's consumption of target vegetables (broccoli) (grams) with/without dressing/sauce. "Weights of broccoli, milk, and the salad dressing (except in the plain condition) were recorded to the nearest 0.1 g once a stable reading was indicated using a calibrated, research grade digital electronic balance before and following the snacks. In the sauce condition, broccoli and the dressing intakes were estimated from the amount of the mixture consumed based on the proportionate contributions of each to the total pre-weight." **Outcome relating to absolute costs/cost effectiveness of interventions:** Not reported **Outcome relating to reported adverse events:** Not reported **Length of follow-up from baseline:**

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Fisher 2012 *(Continued)*

7 weeks

Length of follow-up post-intervention:

Immediately

Subgroup analyses:

None

Loss to follow-up:

Overall = 2% (not specified by group)

Analysis:

Adjusted for clustering

Sample size calculation was performed

Notes

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	(Authors describe as a quasi-experimental design although appear to have randomised classrooms). Randomly allocated to experimental group but the random sequence generation procedure is not described
Allocation concealment (selection bias)	Unclear risk	(Authors describe as a quasi-experimental design although appear to have randomised classrooms). There is no information provided about allocation concealment and therefore it is unclear if allocation was concealed
Blinding of participants and personnel (performance bias) All outcomes	Low risk	Vegetable intake (objective): Objective measure of child's vegetable intake and unlikely to be influenced by performance bias
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Vegetable intake (objective): Objective measure of child's vegetable intake and whether those who weighed the food were blinded is unlikely to have an impact on detection bias
Incomplete outcome data (attrition bias) All outcomes	Low risk	152/155 (98%) completed the study and therefore risk of attrition bias is low
Selective reporting (reporting bias)	Unclear risk	There is no study protocol therefore it is unclear if there was selective outcome reporting
Other bias	Unclear risk	There is insufficient information about baseline imbalances and whether clustering was adjusted for in the analyses

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Forestell 2007

Methods	**Study design:** Randomised controlled trial **Funding:** *"This work was supported by National Institutes of Health grant HD37119. Dr Forestell was the recipient of a Canadian Institutes of Health research postdoctoral fellowship."*
Participants	**Description:** Children aged 4-8 months and their mother **N (randomised):** 45 mother-infant dyads **Age:** Infant (mean): green bean group = 5.6 months, green bean/peaches group = 5.9 months Mother (mean): green bean group = 32.2 years, green bean/peaches group = 31.6 years **% Female:** Infant: green bean group = 38%, green bean/peaches group = 52% **SES and ethnicity:** Years of schooling (mean): green bean group = 14.7 years, green bean/peaches group = 14.8 years **Inclusion/exclusion criteria:** Inclusion criteria: infants had to be born at term, healthy, currently aged between 4 and 8 months and had been weaned to cereal with very little experience with fruits and vegetables. **Recruitment:** "….recruited through advertisements in local newspapers, breastfeeding support groups, and the Supplemental Nutrition Program for Women, Infants, and Children in Philadelphia, Pennsylvania." **Recruitment rate:** Unknown **Region:** Pennsylvania, USA
Interventions	**Number of experimental conditions:** 2 **Number of participants (analysed):** Green bean group: 12 Green bean/peaches group: 26 **Description of intervention:** Green bean group: fed greens beans throughout the 8-day home exposure period. Green bean/peaches group: fed greens beans and then within 1 h peaches throughout the 8-day home exposure period. Both groups were fed green beans in the lab on days 1 and 2 and peaches on days 11 and 12.

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Forestell 2007 *(Continued)*

Duration:

12 days

Number of contacts:

12 exposures (8-day home exposure + 3 lab exposures/test days)

Setting:

Home + lab

Modality:

Face-to-face

Interventionist:

Mother

Integrity:

"To increase compliance, telephone contact was made with the mothers, who recorded the time of day and types and quantities of foods and liquids they fed their infants throughout the study. All of the mothers complied with these instructions."

Date of study:

Unknown

Description of control:

N/A

Outcomes	**Outcome relating to children's fruit and vegetable consumption:** Consumption of green beans and peaches (grams) assessed by weighing the amount of the food in the jar before and after consumption **Outcome relating to absolute costs/cost-effectiveness of interventions:** Not reported **Outcome relating to reported adverse events:** Not reported **Length of follow-up from baseline:** 12 days **Length of follow-up post-intervention:** Immediately **Subgroup analyses:** None **Loss to follow-up:** Green bean group: 25% Green bean/peaches group: 10% **Analysis:**

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Forestell 2007 *(Continued)*

	Unknown if sample size calculation was performed
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	"Infants were assigned randomly to 1 of 2 treatment groups." It is unclear how randomisation occurred.
Allocation concealment (selection bias)	Unclear risk	There is no information provided about allocation concealment and therefore it is unclear if allocation was concealed from those conducting the research.
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	"One group (group GB) was fed green beans, whereas the other (group GB-P) was fed green beans and then (within 1 hour) peaches throughout the 8-day home-exposure period (days 3–10)." "To increase compliance, telephone contact was made with the mothers, who recorded the time of day and types and quantities of foods and liquids they fed their infants throughout the study."
Blinding of outcome assessment (detection bias) All outcomes	High risk	"Mothers fed at their customary pace until the child rejected the food ≥ 3 consecutive times or finished 2 jars of food." Due to the nature of the intervention, mothers would have been aware of the infant's group allocation, and this may have impacted the results.
Incomplete outcome data (attrition bias) All outcomes	High risk	"Four infants were excluded from the analyses of green bean acceptance (4/16)and 3 from those of peach acceptance (3/29) because mothers were non-compliant with test procedures (n=2), infants were sick during testings or exposure (n=2), or infants ate the maximum amount of food offered during their initial exposure (n=3)"
Selective reporting (reporting bias)	Unclear risk	There is no trial registration or protocol.
Other bias	Low risk	None identified

Gerrish 2001

Methods	**Study design:** Randomised controlled trial **Funding:** *"Supported by grants HD37119 and HD08428 from the National Institutes of Health and by a grant from the Gerber Companies Foundation. The Gerber Products Company supplied the baby foods used in this study."*
Participants	**Description:** Mothers with healthy, term infants **N (Randomised):** 48 mother-infant dyads

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Gerrish 2001 *(Continued)*

Age:

Infant (mean): carrot group = 4.6 months, potato group = 4.5 months, variety group = 4.8 months

Mother (mean): carrot group = 27.4 years, potato group = 25.4 years, variety group = 29.9 years

% Female:

Infant: carrot group = 50%, potato group = 50%, variety group = 50%

SES and ethnicity:

"The racial background of the mothers and their infants was 45.8% African American, 39.6% white, 2.1% Hispanic, and 12.5% other ethnic groups."

Inclusion/exclusion criteria:

Inclusion criteria: non-smoking mothers, began feeding cereal to their infants in the past month and planned on introducing other solid foods during the next few weeks, and only mothers of formula-fed infants.

Recruitment:

"recruited from advertisements in local newspapers and from Women, Infant and Children programs in Philadelphia."

Recruitment rate:

Unknown

Region:

Philadelphia, USA

Interventions

Number of experimental conditions: 3

Number of participants (analysed):

Carrot group: 16

Potato group: 16

Variety group: 16

Description of intervention:

Carrot group: during the home exposure period infants were fed pureed carrots only (the target vegetable).

Potato group: during the home exposure period infants were fed pureed potatoes only.

Variety group: during the home exposure period infants were fed a variety of vegetables that did not include carrots (potato, squash, peas).

All groups were fed pureed carrots in the lab on days 1 and 11.

Duration:

11 days

Number of contacts:

11 exposures (9 day home exposure + 2 lab exposures/test days)

Setting:

Home + lab

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Gerrish 2001 *(Continued)*

Modality:

Face-to-face

Interventionist:

Mothers

Integrity:

"To encourage compliance, each mother kept a daily record of what they fed their infants, and daily phone contact was made with each mother during the exposure period."

Date of study:

Unknown

Description of control:

N/A

Outcomes	**Outcome relating to children's fruit and vegetable consumption:** Consumption of pureed carrots (grams): assessed by weighing the amount of the food in the jar before and after consumption using a top-loading balance. **Outcome relating to absolute costs/cost-effectiveness of interventions:** Not reported **Outcome relating to reported adverse events:** Not reported **Length of follow-up from baseline:** 11 days **Length of follow-up post-intervention:** Immediately **Subgroup analyses:** None **Loss to follow-up:** No loss to follow-up **Analysis:** Unknown if sample size calculation was performed
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	"Randomly assigned to one of 3 experimental groups" not enough information reported. Randomly allocated to experimental group but the random sequence generation procedure is not described.

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Gerrish 2001 *(Continued)*

Allocation concealment (selection bias)	Unclear risk	No information reported There is no information provided about allocation concealment and therefore it is unclear if allocation was concealed.
Blinding of participants and personnel (performance bias) All outcomes	High risk	Mothers fed their infants and there is no mention of blinding and so high risk of performance bias
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Vegetable intake was determined by weighing vegetables and therefore low risk of detection bias.
Incomplete outcome data (attrition bias) All outcomes	Low risk	No loss to follow-up – 16 dyads per group All participants recruited completed the study and therefore at very low risk of attrition bias
Selective reporting (reporting bias)	Unclear risk	No trial protocol is available
Other bias	Low risk	Low risk of other bias

Haire-Joshu 2008

Methods	**Study design:** Cluster-randomised controlled trial **Funding:** *"Funding for this work was provided by National Cancer Institute (R01 CA68398)."*
Participants	**Description:** Parents and their children participating in the 'Parents as Teachers' (PAT) programme sites in rural Missouri (USA) **N (Randomised):** 16 PAT sites, 1658 families **Age:** Children: 1 to 3 y: intervention = 67%, control = 61% 4 to 6 y: intervention = 33%, control = 40% Parents: < 25 y: intervention = 28%, control = 21% 25 to 29 y: intervention = 35%, control = 33% 30 to 34 y: intervention = 21%, control = 24% 35+ y: intervention = 17%, control = 23%

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Haire-Joshu 2008 *(Continued)*

% Female:

Children: intervention = 47%, control = 49%

Parents: intervention = 99%, control = 98%

SES and ethnicity:

Parent - Not high school graduate: intervention = 16%, control = 11%

Parent - College graduate: intervention = 20%, control = 25%

Household income:

< USD 20K: intervention = 30%, control = 25%

USD 20K to 35K: intervention = 30%, control = 25%

USD 35K to 50K: intervention = 13%, control = 18%

USD 50+K: intervention = 28%, control = 32%

Ethnicity - White: intervention = 86%, control = 80%

Inclusion/exclusion criteria:

Not specified

Recruitment:

"16 PAT programs from rural, southeast Missouri were recruited into the study. Within these sites 2012 families enrolled were assessed for eligibility and willingness to participate by parent educators." PAT is a "parenting and child development program with over 3000 sites across all 50 states and 8 US territories." PAT provides free services on "an annual basis to parents at the time of pregnancy until the youngest child is 3 years of age. However, PAT extends services until the youngest child is 5 years of age in the case of underserved families, defined as single or minority parent homes, those living in poverty or low parent education. In addition, underserved families may receive additional home visits as a means of ensuring complete delivery of the curriculum."

Recruitment rate:

Families: 79% families

PAT sites: unknown

Region:

Rural southeast Missouri (USA)

Interventions

Number of experimental conditions: 2

Number of participants (analysed):

Intervention = 605, Control = 701

Description of intervention:

Intervention families received the standard PAT program plus the 'Hi 5 for Kids' (H5-KIDS) protocol. "H5-KIDS was comprised of three components: a tailored newsletter, a series of home visits, and materials for the parent and child, including storybooks."

Computer-tailored nutrition newsletter

"To develop the tailored newsletter, parents were first formally enrolled in H5-KIDS and completed a pretest interview. Relevant data was then imported into an in-house computer-based tailoring program. Scores were calculated based on FV knowledge and intake, frequency of parental modeling, style

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Haire-Joshu 2008 *(Continued)*

of parenting (coercive or non-coercive), and quality of the home food environment (FV availability). Each newsletter began with a bulleted tailored statement that included the self reported servings of FVs the parent and the child consumed per day. Additional parent data (e.g. FV knowledge, parental role modeling, non-coercive parenting skills, FV availability) were each uniquely used to individualize messages and describe the themes of each of the four storybook sets the family would receive at their home visits. For example, if participant data indicated a parent did not eat FV in front of their child very often (< 7/week), the tailored messages would emphasize the importance of modeling FV intake in front of the child as a means of improving consumption, and provide relevant examples of how this could be accomplished. The parent was then referred to H5-KIDS storybooks that provided examples of modeling for the child. In contrast, parents who scored appropriately in each individual area received messages of praise encouraging them to continue their behaviors. Newsletters were mailed to the parent's home at the beginning of the program."

Home visits

"Parent educators delivered four H5-KIDS home visits, each of which addressed the core program areas (knowledge, parental modeling of FV intake, non-coercive feeding practices, FV availability). Parent educators then reinforced the core content in subsequent visits. Consistent with the philosophy of the PAT program, each visit provided examples of parent–child activities designed around healthy nutrition, that the parent could use to promote the child's language and cognitive ability, and fine and gross motor skill development (e.g. having the child learn the names and colors of various FV; child assists with selecting a variety of FV for breakfast). As part of each visit, parents also received materials and informational handouts with suggestions for improving feeding practices and the food environment in the home. Consistent with the standard PAT program, each home visit was designed to allow for 60 min of contact."

Sing-a-long storybooks with audio cassette

"At each home visit children received a H5-KIDS sing-a-long storybook with audio cassette tape and a coloring book. Each storybook reinforced one of the core areas of the H5-KIDS program through the use of child friendly characters and appealing storylines presented through songs."

Duration:

60 minutes per home visit

Number of contacts:

4 H5-KIDS home visits plus 5 standard PAT home visits

Setting:

Home

Modality:

Multiple (face-to-face, computer-tailored newsletters and storybooks)

Interventionist:

Parent educators who received 4 hours of training on nutrition content and overview of materials

Integrity:

"The H5-KIDS program was delivered in its entirety to 78% of intervention families."

Date of study:

2001 to 2006

Description of control:

"Parent educators deliver a standardized curriculum via at least five home visits, on-site group activities and newsletters." ("PAT ... empowers parents ... by encouraging positive parent-child communi-

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Haire-Joshu 2008 *(Continued)*

	cation and increasing parents' knowledge of ways to stimulate children's social and physical development.")
Outcomes	**Outcome relating to children's fruit and vegetable consumption:** Child's daily servings of fruits and of vegetables assessed using the Saint Louis University for Kids Food Frequency Questionnaire (SLU4Kids FFQ) administered by parent telephone survey **Length of follow-up from baseline:** Average time to follow-up was 7 months (range 6 to 11 months) **Subgroup analyses:** Normal weight vs overweight children **Loss to follow-up:** Intervention: 15% (+ 5% missing or inconsistent data) Control: 17% (+ 5% missing or inconsistent data) **Analysis:** Analysis was not adjusted, but justification was provided. "There was minimal impact of grouping by site on the principle measures of impact in this study (ICC child fruit and vegetable servings = 0.00095 and ICC parent fruit and vegetable servings = 0.01). Therefore, the analyses did not adjust for group." Sample size calculation was performed.
Notes	The proportion of normal weight vs overweight children not reported, making it difficult to interpret the subgroup analysis. First reported outcome (fruit intake) was extracted for inclusion in meta-analysis. Sensitivity analysis - primary outcome: Primary outcome not stated, fruit or vegetable intake only reported outcome.

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	"A computer generated number table was used for random assignment to intervention or control."
Allocation concealment (selection bias)	High risk	"Families enrolled in PAT were assessed for eligibility and willingness to participate by parent educators." Contact with the author indicated that parent educators were aware of site allocation when they were enrolling participants to the trial
Blinding of participants and personnel (performance bias) All outcomes	High risk	Study personnel were aware of allocation - "Sites were not blind to assignment." Contact with the author indicated that parent participants completed a consent form which described the activities of their experimental condition, and were therefore unlikely to be blind to allocation. Given the trial outcomes were based on parental report, the review authors judged there was potential for performance bias
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Contact with the author indicated that outcome assessors were blind to group allocation

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Haire-Joshu 2008 *(Continued)*

Incomplete outcome data (attrition bias) All outcomes	Low risk	Rates of loss to follow-up (intervention = 15%, control = 17%) and missing/ inconsistent data (intervention = 5%, control = 5%) were similar across groups. No information was provided about reasons for loss to follow-up
Selective reporting (reporting bias)	Unclear risk	A subgroup analysis was conducted based on child's weight status (normal vs overweight). "A final limitation of the study is the limited power to definitely assess the impact of the intervention of children within weight status subgroups." It is unclear whether the subgroup analysis was pre-specified.
Other bias	Low risk	Rationale provided for not adjusting analysis for clustering. "There was minimal impact of grouping by site on the principle measures of impact in this study (ICC child fruit and vegetable servings = 0.00095 and ICC parent fruit and vegetable servings = 0.01). Therefore, the analyses did not adjust for group." No further risks of bias identified.

Harnack 2012

Methods	**Study design:** Randomised controlled trial – cross-over **Funding:** *"Funded by a grant from the Robert Wood Johnson Foundation Healthy Eating Research program."*
Participants	**Description:** Preschool-aged children attending a Head Start centre in Minneapolis, Minnesota, USA **N (Randomised):** 57 children **Age:** 2 to 3 years = 51% 4 to 5 years = 49% **% Female:** Not specified **SES and ethnicity:** Child: Non-Hispanic African-American = 76%, Hispanic or Latina/Latino = 6%, Multi-racial = 13%, American Indian = 4%, Non-Hispanic White = 2% Parent education: Less than high school = 9%, High school graduate = 42%, Some college = 49% **Inclusion/exclusion criteria:** Not specified **Recruitment:** “Children in three preschool classrooms were recruited. A consent form and letter explaining the study was sent to parents.” **Recruitment rate:**

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Harnack 2012 *(Continued)*

	98% (57/58) **Region:** Minneapolis, Minnesota (USA)
Interventions	**Number of experimental conditions:** 3 **Number of participants (analysed):** Overall = 53 **Description of intervention:** Fruit and vegetable first: "During the fruit and vegetable first experimental weeks all fruits and non-starchy vegetables on the lunch menu were served traditional family style five minutes in advance of other menu items. Children were allowed to begin eating the fruit and vegetable items served first, with the remaining menu items (e.g. milk, entrée, side dishes) placed on the tables for traditional family style meal service five minutes following distribution of the first course. All other usual meal service practices remained the same during the fruit and vegetable first experimental condition." Provider portioned: "During the provider portioned experimental condition, a plate was prepared for each child that contained a specific quantity of each menu item." **Duration:** "Each condition was implemented for two one-week periods over the six week period, for a total of two weeks per condition" **Number of contacts:** Unclear, each day of the 6-week period (dependent on how many days children attend) **Setting:** Preschool **Modality:** Face-to-face **Interventionist:** Classroom teachers **Integrity:** No information provided **Date of study:** Unknown **Description of control:** Usual 'control' meal service: " "During each day of the control weeks, the usual traditional family style meal service approach to serving lunch meals at the center was followed. During usual lunch meals at the center children are seated around tables, and each food item on the menu is passed around the table from child to child in serving bowls for self-service."
Outcomes	**Outcome relating to children's fruit and vegetable consumption:** Child's consumption of fruit and vegetable serves (1 cup equivalents).

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Harnack 2012 *(Continued)*

Study staff trained and certified in conducting lunch observations recorded food intake on a meal observation form. "The lunch observation data were entered into Nutrition Data System for Research (NDSR), a dietary analysis software program."

Outcome relating to absolute costs/cost effectiveness of interventions:

Not reported

Outcome relating to reported adverse events:

Not reported

Length of follow-up from baseline:

6 weeks

Length of follow-up post-intervention:

Immediately

Subgroup analyses:

None

Loss to follow-up:

Overall = 7%

Analysis:

Unknown if sample size calculation was performed

Notes	Sensitivity analysis - primary outcome: Primary outcome not stated, fruit and vegetable intake is the only outcome

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Randomly allocated to experimental group but the random sequence generation procedure is not described
Allocation concealment (selection bias)	Unclear risk	There is no information provided about allocation concealment and therefore it is unclear if allocation was concealed
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Intake: There is no mention if children were blinded and so it is unclear how this may impact children's vegetable intake
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Intake: Observers made visual estimations of food amounts to determine the amount taken but it is unclear if observers were blinded to condition. Food amounts may not be accurately estimated by observers
Incomplete outcome data (attrition bias) All outcomes	Low risk	3/57 (93%) completed the study and therefore the risk of attrition bias is low
Selective reporting (reporting bias)	Unclear risk	There is no study protocol therefore it is unclear if there was selective outcome reporting

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Harnack 2012 *(Continued)*

Other bias	Low risk	Contamination bias that could threaten the internal validity is unlikely to be an issue

Hausner 2012

Methods	**Study design:** Cluster-randomised controlled trial **Funding:** *"The research leading to these results has received funding from the European Community's Seventh Framework Programme (FP7/2007-2013) under the Grant Agreement No. FP7-245012-HabEat."*
Participants	**Description:** Children aged 2 to 3 years from 5 nurseries in the Copenhagen area and suburbs **N (Randomised):** 104 children ("from 5 nurseries, involving 17 groups") **Age:** Mean: Mere exposure group = 27.8 months, Flavour-flavour learning group = 27.5 months, Flavour-nutrient learning group = 30.8 months **% Female:** Mere exposure group = 63%, Flavour-flavour learning group = 42%, Flavour-nutrient learning group = 54% **SES and ethnicity:** Not specified **Inclusion/exclusion criteria:** Not specified **Recruitment:** "Children aged 2–3 years were recruited for the experiment from five nurseries, involving 17 groups, in the Copenhagen area and suburbs." **Recruitment rate:** Unknown **Region:** Denmark
Interventions	**Number of experimental conditions:** 3 **Number of participants (analysed):** Mere exposure group = 20 Flavour-flavour learning group = 30 Flavour-nutrient learning group = 21

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Hausner 2012 *(Continued)*

Description of intervention:

Mere exposure group, exposed to unmodified artichoke puree 10 times

Flavour-flavour learning group, exposed to a sweetened artichoke puree 10 times

Flavour-nutrient learning group, exposed 10 times to an energy dense artichoke puree with added fat

Duration:

4 weeks

Number of contacts:

10 exposures

Setting:

Preschool

Modality:

Face-to-face

Interventionist:

Nursery staff

Integrity:

No information provided

Date of study:

Unknown

Description of control:

N/A

Outcomes

Outcome relating to children's fruit and vegetable consumption:

Child's consumption of unmodified artichoke puree (grams). "Testing took part in group rooms. The children were seated at tables where they would normally eat their lunch to mimic the natural eating environment. The purées were served in preweighted plastic cups at room temperature. The standard serving size was 100 g for artichoke and 130 g carrot. Intake was measured individually and recorded for all sessions with a precision of 1 g."

Outcome relating to absolute costs/cost-effectiveness of interventions:

Not reported

Outcome relating to reported adverse events:

Not reported

Length of follow-up from baseline:

5 and 8 months

Length of follow-up post-intervention:

3 and 6 months

Subgroup analyses:

None

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Hausner 2012 *(Continued)*

Loss to follow-up (at 3 and 6 months):

Mere exposure group = 9%, 38%

Flavour-flavour learning group = 21%, 9%

Flavour-nutrient learning group = 23%, 46%

Analysis:

Adjusted for clustering (ANOVA proc mixed models).

Unknown if sample size calculation was performed.

Notes

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Randomly allocated to experimental group but the random sequence generation procedure is not described
Allocation concealment (selection bias)	Unclear risk	There is no information provided about allocation concealment and therefore it is unclear if allocation was concealed
Blinding of participants and personnel (performance bias) All outcomes	Low risk	Vegetable intake: Objective measure of child's vegetable intake and unlikely to be influenced by performance bias
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Vegetable intake: Intake was weighed and therefore it is unlikely that this would be influenced by detection bias
Incomplete outcome data (attrition bias) All outcomes	High risk	Of 104 children, 71 (68%) completed the 6-month follow-up and therefore at high risk of attrition bias
Selective reporting (reporting bias)	Unclear risk	There is no study protocol therefore it is unclear if there was selective outcome reporting
Other bias	Unclear risk	The groups differed in age, but age was included as a covariate to correct for the possible influence on intake. Therefore the risk of other bias is unclear

Heath 2014

Methods

Study design:

Randomised controlled trial - within subject

Funding:

"This work was supported by a University of Reading Life Sciences Studentship to the first author."

Participants

Description:

Families with children aged between 20 and 24 months

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Heath 2014 *(Continued)*

N (Randomised):

60 parent-child dyad

Age:

Child (mean): 22 months (range 20-24 months)

Parent: NR

% Female:

Child = 48%

Parent: NR

SES and ethnicity:

“78% came from a household where at least one parent was educated to graduate level.”

“88% of families were white"

Inclusion/exclusion criteria:

Not specified

Recruitment:

“families with children aged between 20 and 24 months were recruited from the University of Reading’s Child Development Group database”

“Parents were contacted by telephone and given a brief overview of the experiment. If a parent gave consent to their participation, the child was randomly allocated to one of three initial status”

Recruitment rate:

100%

Region:

UK

Interventions

Number of experimental conditions: 3

Number of participants (analysed): 57

Description of intervention:

Parents were asked whether their child liked, disliked or had not tried each vegetable listed in the Vegetable Liking and Familiarity Questionnaire. For each child, two vegetables were randomly selected from those for which the parent’s responses matched the initial status set to which the child had been assigned; these became the target (exposed) and control (non-exposed) foods for that child.

Parents were sent a picture book about their child’s target vegetable - the books consisted of pictures and information about the target vegetable.

Duration:

2 weeks

Number of contacts:

14 readings (5 min/d, 2 weeks)

Setting:

Home + lab

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Heath 2014 *(Continued)*

	Modality: Face-to-face **Interventionist:** Parents **Integrity:** “the last page contained a tick-sheet reading record upon which parents were asked to note how many times they looked at the book with their child.” “According to the reading records provided by parents, children saw their book an average of 14.9 times (SD = 9.9) during the exposure phase” **Date of study:** Unknown **Description of control:** N/A
Outcomes	**Outcome relating to children's fruit and vegetable consumption:** Consumption of target vegetable they had seen in their book and a non-exposed control vegetable of the same initial status (proportion): “Amount consumed” was coded as a proportion of the portion provided, again using a 5-point scale (0 = none, 1 = nibble, 2 = less than ½ tsp, 3 = ½ tsp, 4 = whole portion).” **Outcome relating to absolute costs/cost-effectiveness of interventions:** Not reported **Outcome relating to reported adverse events:** Not reported **Length of follow-up from baseline:** 14 days (unless rescheduled) **Length of follow-up post-intervention:** Immediately **Subgroup analyses:** None **Loss to follow-up:** 5% **Analysis:** Unknown if sample size calculation was performed
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement

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Heath 2014 *(Continued)*

Random sequence generation (selection bias)	Unclear risk	Randomly allocated to experimental group but the random sequence generation procedure is not described.
Allocation concealment (selection bias)	Unclear risk	There is no information provided about allocation concealment and therefore it is unclear if allocation was concealed.
Blinding of participants and personnel (performance bias) All outcomes	Low risk	The likelihood of performance bias in relation to vegetable consumption is low, given the children's age.
Blinding of outcome assessment (detection bias) All outcomes	High risk	No blinding. The coder was not blind to the liked/disliked or target/control food on each trial and so high risk of detection bias even though a second blind coder independently coded 20% of the recorded test sessions.
Incomplete outcome data (attrition bias) All outcomes	Low risk	There were 57/60 infants who completed the study. Attrition rate < 20% and therefore low risk of attrition bias.
Selective reporting (reporting bias)	Unclear risk	No trial protocol
Other bias	Low risk	Low risk of other bias

Hetherington 2015

Methods	**Study design:** Randomised controlled trial **Funding:** *"Funding received through the EC Seventh Framework Programme (FP7/2007-2013) under the IAPP 230637 "VIVA: V is for Vegetable – Applying Learning theory to increase liking and intake of vegetables"*
Participants	**Description:** Mothers with infants under 12 weeks old **N (Randomised):** 40 mother-infant dyads (20 intervention, 20 control) **Age:** Infant (mean): Intervention = 4.78 months, Control = 4.88 months Mother (mean): Intervention = 33.7 years, Control = 30.9 years **% Female:** Infant: 57% **SES and ethnicity:** Not specified **Inclusion/exclusion criteria:** Not specified

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Hetherington 2015 *(Continued)*

Recruitment:

"Mothers were recruited from the local community using widespread advertising within mother and baby groups and a recruitment agency."

Recruitment rate:

83% (40/48)

Region:

UK

Interventions	**Number of experimental conditions:** 2 **Number of participants (analysed):** Intervention = 17, Control = 18 **Description of intervention:** "IG infants received 12 daily exposures to vegetable puree added to milk (days 1–12), then 12 x 2 daily exposures to vegetable puree added to baby rice at home (days 13–24). Then both groups received 11 daily exposures to vegetable puree (days 25-35). They were each given a pack containing a 35 day diary and all of the equipment and foodstuffs they would need to complete the study. They were informed that breast or formula feeding should continue as normal." **Duration:** 24 days **Number of contacts:** 24 exposures (daily) **Setting:** Home + lab **Modality:** Face-to-face **Interventionist:** Parents **Integrity:** "Another possible limitation of the study was that most of the intervention was conducted at home. It is then difficult to ensure that instructions were strictly followed." **Date of study:** Recruitment took place between September 2011 and May 2012. **Description of control:** "Plain milk and cereal were given to the control group (days 1-24)".
Outcomes	**Outcome relating to children's fruit and vegetable consumption:** Consumption of vegetables (grams) measured by "a small set of portable digital pocket scales (MYCO MZ-100, Dalman) to weigh accurately intakes (i.e. by weighing bottles or bowls before and after each feed) of all feeds consumed across the day."

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Hetherington 2015 *(Continued)*

Outcome relating to absolute costs/cost effectiveness of interventions:

Not reported

Outcome relating to reported adverse events:

Not reported

Length of follow-up from baseline:

35 days, 6 months and 18 months

Length of follow-up post-intervention:

Immediate, ˜5 months and ˜17 months

Subgroup analyses:

None

Loss to follow-up (immediate, ˜5 months, ˜17 months):

Intervention = 15%, 25%, 45%

Control = 10%, 20%, 15%

Analysis:

Unknown if sample size calculation was performed.

Notes

First reported outcome (vegetable intake grams during laboratory session) at immediate follow-up was extracted for inclusion in meta-analysis. Data not reported at ˜5 months, and not enough participants to analyse data at ˜17 months.

Sensitivity analysis - primary outcome: Primary outcome not stated, fruit and vegetable intake 1st listed outcome in abstract

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	"Mothers were randomised to either the intervention (n = 20) or control group (n = 20) after they had consented to the study and before they had completed any questionnaires." No information provided about the randomisation procedure
Allocation concealment (selection bias)	Unclear risk	No information provided about allocation concealment
Blinding of participants and personnel (performance bias) All outcomes	High risk	The participants were aware of whether or not they were adding vegetable puree to milk and rice cereal No blinding, and the outcome is likely to be influenced by lack of blinding
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Food intake was weighed which would be low risk. However, "the researcher and mother made a joint decision on when 3 refusals were reached". This may have impacted on outcome assessment
Incomplete outcome data (attrition bias) All outcomes	Low risk	"Forty parents provided informed consent for their infants to take part in the study; however, complete data were collected on 36 mother–infant dyads."

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Hetherington 2015 *(Continued)*

		For outcome of vegetable intake grams during laboratory session 17 mothers in the intervention group and 18 mothers in the control group provided data. "At 6 months follow-up, 15 mothers in the IG completed the two feeding sessions, while 16 mothers completed them in the CG (86% return rate)."
Selective reporting (reporting bias)	Unclear risk	No protocol listing prespecified outcomes
Other bias	Low risk	Contamination bias that could threaten the internal validity is unlikely to be an issue

Hong 2018a

Methods	**Study design:** Randomised controlled trial **Funding:** *"Phan Y. Hong received summer funding from the University of Wisconsin Oshkosh Office of Faculty Development and Grants to complete this study during the summer months. No external funding was received for the study. The second and fourth author, Matthew Hanson and Shelby Kelso, received some university funding to aid in the study design and data collection of this study."*
Participants	**Description:** Children aged 3-5 years old attending 2 preschools (1 Montessori private and 1 traditional public) **N (Randomised):** 20 children **Age:** Child, not reported by group allocation (mean): site 1 = 4.2 years, site 2 = 3.8 years **% Female:** Child, not reported by group allocation: site 1 = 50%, site 2 = 60% **SES and ethnicity:** Child, not reported by group allocation (white): site 1 = 80%, site 2 = 70% **Inclusion/exclusion criteria:** Not specified **Recruitment:** Not specified **Recruitment rate:** Unknown **Region:** USA
Interventions	**Number of experimental conditions:** 2

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Hong 2018a *(Continued)*

Number of participants (analysed):

Intervention = 9, control = 11

Description of intervention:

Children engaged in 3 separate mindfulness activities: energising mindful activities (e.g. grass movement), mindfulness of food and eating (e.g. observe and describe food), and calming mindful activities (e.g. breathing or listening exercises). All children completed 4 energetic-, 4 eating-, and 4 calming-mindfulness-based activities each week.

Duration:

4 weeks

Number of contacts:

16 (30 min/day for 4 days each week)

Setting:

Preschool

Modality:

Face-to-face

Interventionist:

Graduate student group leaders

Integrity:

Fidelity:*"Materials presented by group leaders were scripted for each session to promote uniformity in the intervention delivery across sessions and school research sites. Although group leaders approached the mindfulness and control condition in different ways as highlighted below, in both conditions across all sessions, children engaged in the eating activity for 5 min, and the eating activity always followed the energizing activity and was always followed by the calming activity."*

No other information provided

Date of study:

Unknown

Description of control:

The control condition mirrored the mindfulness, except during the eating task, the group leader refrained from directing the children to observe and non-judgmentally describe the food. Instead, the group leader allowed the children to guide the conversation, allowed them to freely talk about the food, and did not redirect them to use non-judgmental words during the eating period.

Outcomes

Outcome relating to children's fruit and vegetable consumption:

Child's consumption of vegetables (pieces) assessed using self-report, *"children in both the mindfulness and control condition reported on the amount eaten by circling 0, 1, 2, or 3 to indicate pieces consumed."*

Outcome relating to absolute costs/cost-effectiveness of interventions:

Not reported

Outcome relating to reported adverse events:

Not reported

Length of follow-up from baseline:

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Hong 2018a *(Continued)*

4 weeks

Length of follow-up post-intervention:

Immediate

Subgroup analyses:

None

Loss to follow-up (at 2 and 14 months)

No loss to follow-up

Analysis:

Sample size calculations not performed, *"there may be a lack of statistical power due to the small number of children involved in the study"*

Notes

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Children were randomly assigned to either a mindfulness or control condition within each site. No more information
Allocation concealment (selection bias)	Unclear risk	No information
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Unclear if children were aware of the purpose of the intervention
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Unclear if children were aware of the purpose of the intervention: self-reported outcome
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Unclear if loss to follow-up
Selective reporting (reporting bias)	Unclear risk	No protocol, registration
Other bias	Low risk	Contamination bias: unlikely children in control received any mindfulness intervention

Hong 2018b

Methods

Study design:

Cluster-randomised controlled trial

Funding:

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Hong 2018b *(Continued)*

	Not reported
Participants	**Description:** Children aged 4-5 years old enrolled at a private pre-kindergarten programme in the southeastern USA, and their parents **N (Randomised):** 6 classrooms, 49 parent/child dyads **Age:** Child (years) 4: Intervention = 54.5%, control = 40% 5: Intervention = 45.5%, control = 60% Parent (years) 18-24: intervention = 9%, control = 15% 25-34: intervention = 41%, control = 30% 35-44: intervention = 50%, control = 55% **% Female:** Child: Intervention = 32%, control = 50% **SES and ethnicity:** Education Bachelor's degree/Master's/PhD: intervention = 68%, control = 50% Marital status Married: intervention = 77%, control = 90% **Inclusion/exclusion criteria:** Not specified **Recruitment:** *"Families were recruited from six classrooms in the pre-kindergarten program."* **Recruitment rate:** Unknown **Region:** Southeastern USA
Interventions	**Number of experimental conditions:** 2 **Number of participants (analysed):** Intervention = 22 parent/child dyads, control = 20 parent/child dyads **Description of intervention:** *"All backpacks included a children's picture book, instructions and supplies for three hands-on activities, a short parent feedback form about the activities, and a brief letter explaining how to use the backpack."*

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Hong 2018b *(Continued)*

"Families in the experimental group received a family backpack focused on eating fruits and vegetables."

Duration:

1-2 weeks, *"Although each family was allowed to keep the backpack for up to 2 weeks, the average amount of time families kept the backpacks was about 7 days, from a Monday afternoon to the following Monday morning."*

Number of contacts:

Unclear, unknown used of backpack activities by parent/child

Setting:

Home

Modality:

Multiple (face-to-face, hands-on activities, written materials)

Interventionist:

Parent

Integrity:

No information provided

Date of study:

Unknown

Description of control:

"Families in the control group received a family backpack focused on handwashing, with no nutrition information included."

Outcomes	**Outcome relating to children's fruit and vegetable consumption:** Child's consumption of fruit and vegetables (self-reported). *"Parents reported the number of fruits and vegetables their child typically consumes in a day, using a 6-point scale (0, 1, 2, 3, 4, and 5 or more)."* **Outcome relating to absolute costs/cost-effectiveness of interventions:** Not reported **Outcome relating to reported adverse events:** Not reported **Length of follow-up from baseline:** 4 weeks **Length of follow-up post-intervention:** 2 weeks **Subgroup analyses:** None **Loss to follow-up (at 2 weeks)** Overall = 14% (not specified by group) **Analysis:**

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Hong 2018b *(Continued)*

	Unknown if adjusted for clustering Sample size calculations not performed. *"Because of the exploratory nature of this pilot study, a power analysis was not conducted prior to data collection."*

Notes

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Classrooms in 1 building were randomly assigned to the experimental group and classrooms in the other building to the control group using a coin flip. 3 classrooms were randomly selected from each building to participate, using random numbers drawn from a list of all eligible classrooms.
Allocation concealment (selection bias)	Unclear risk	No information for allocation concealment provided
Blinding of participants and personnel (performance bias) All outcomes	High risk	Parents were provided information about the study, unclear if knowledge of other group, may influence reported child consumption (not actual consumption)
Blinding of outcome assessment (detection bias) All outcomes	High risk	Unclear if parents were blinded, no description described on information they received. Parent self-reported survey on fruit and vegetable consumption therefore at high risk
Incomplete outcome data (attrition bias) All outcomes	Low risk	7/49 = 14%, not reported by group, no ITT reported "A total of 42 families completed both pre- and post-surveys and were included in the study sample. An additional seven families who did not complete all parts of the study were excluded from data analyses."
Selective reporting (reporting bias)	Unclear risk	Unclear, not protocol, registration
Other bias	Low risk	Recruitment bias (low risk): each classroom was designated a backpack group and circulated over the 12 weeks for children Baseline imbalance (low risk): independent T tests were conducted to examine demographic differences between the experimental and control groups; no significant differences were found between groups on any demographic measure Loss of clusters (low risk): no Incorrect analysis (low risk): not adjusted for clustering. The review auythors adjusted for in the meta-analysis Contamination bias (low risk): no

Hunsaker 2017

Methods	**Study design:** Randomised controlled trial **Funding:**

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Hunsaker 2017 *(Continued)*

	Not reported
Participants	**Description:** Children enrolled in the university-based preschool during the 2013-2014 academic year and their parents **N (Randomised):** 65 parent-child dyads **Age:** Intervention (mean): 5 years Control (mean): 5 years **% Female:** Intervention: 38% Control: 64% **SES and ethnicity:** Monthly income (mean): Intervention = USD 6100, Control = USD 5336 Parent education High school: intervention = 0%, control = 3%; some college: intervention = 0%, control = 6%; Bachelor's degree: intervention = 45%, control = 55%; Graduate degree: intervention = 45%, control 30% Ethnicity Non-Hispanic white: intervention = 84%, control = 94%; Hispanic: intervention = 3%, control = 0%; Asian: intervention = 6%, control = 0%; Biracial: intervention = 6%, control = 6% **Inclusion/exclusion criteria:** No explicit inclusion/exclusion criteria stated for this trial, however the children had to be enrolled in the university-based preschool during academic year 2013-14 and were excluded if they participated in the 2012-2013 academic year. **Recruitment:** "The parent who self-identified as most responsible for preparing the child's meals was invited to complete the surveys. Preschool personnel sent an email inviting parents to consent to participate. Consent was obtained through an online survey." **Recruitment rate:** 65% (65/100) **Region:** USA
Interventions	**Number of experimental conditions:** 2 **Number of participants (analysed):** Intervention = 32 parent-child dyads, control = 33 parent-child dyads **Description of intervention:**

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Hunsaker 2017 *(Continued)*

Parents received a health report describing their child's average daily fruit and vegetable consumption along with the guidelines that children should consume 5 fruits and vegetables per day. Parents were also given a standardized set of recommendations for increasing fruit and vegetable intake as well as more comprehensive recommendations for how to increase their child's fruit and vegetable intake (i.e. a more detailed list of parent behaviours to increase consumption).

Duration:

4 weeks

Number of contacts:

Parents received one health report

Setting:

Home

Modality:

Written materials

Interventionist:

Preschool personnel provided the report

Integrity:

No information provided

Date of study:

2013-2014 academic year

Description of control:

"A delayed intervention group completed the initial baseline assessment but received no intervention until after the completion of the week 4 assessment."

Outcomes

Outcome relating to children's fruit and vegetable consumption:

Children's consumption of fruit and vegetables (servings per day): "Parents of both groups completed the NCI Fruit and Vegetable Screener Questionnaire…. This measure was adapted to ascertain fruit and vegetable consumption over the previous week to allow for more frequent measurement of intake."

Outcome relating to absolute costs/cost-effectiveness of interventions:

Not reported

Outcome relating to reported adverse events:

Not reported

Length of follow-up from baseline:

4 weeks

Length of follow-up post-intervention:

Immediately

Subgroup analyses:

None

Loss to follow-up:

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Hunsaker 2017 *(Continued)*

	There was no loss to follow-up **Analysis:** Unknown if sample size calculation was performed
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	"Participants were randomly assigned to either an intervention (n=32) or a control (n=33) group using a random number generator." Unclear how the sequence was generated
Allocation concealment (selection bias)	Unclear risk	There is no mention of allocation concealment.
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	It is unclear whether those delivering the intervention, or the parents receiving the intervention were aware of their experimental group allocation.
Blinding of outcome assessment (detection bias) All outcomes	High risk	"Parents completed the NCI Fruit and Vegetable Screener Questionnaire as an online survey." Child fruit and vegetable consumption assessed via parent self-report
Incomplete outcome data (attrition bias) All outcomes	High risk	"In study 2, 22.6%, 44.4%, and 14% of combined fruit and vegetable data were missing at times 1, 2, and 3, respectively. Missing values analysis determined that data were missing at random; thus the researchers used full information maximum likelihood estimation." Greater than 20% missing data at two time points, with over 40% of data missing at Time 2
Selective reporting (reporting bias)	Unclear risk	There is no trial registration or protocol paper.
Other bias	Low risk	No other source of bias was identified.

Keller 2012

Methods	**Study design:** Randomised controlled trial **Funding:** *"Funding for this study came from NIH grant K01DK068008 and a St. Luke's Roosevelt Hospital Pilot Award. Additional support came from the Obesity Research Center Grant"*
Participants	**Description:** Healthy children aged 4 to 5 years from diverse ethnic backgrounds **N (Randomised):**

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Keller 2012 *(Continued)*

	19 children **Age:** 4 to 5 years **% Female:** Not specified **SES and ethnicity:** "from diverse ethnic backgrounds." **Inclusion/exclusion criteria:** "All the children were "at risk for obesity," based on having at least one parent with a BMI≥25 kg/m2, and they had to consume fewer than two servings of F&V per day, based on parental report during a screening phone call." **Recruitment:** Not specified **Recruitment rate:** Unknown **Region:** Pennsylvania (USA)
Interventions	**Number of experimental conditions:** 2 **Number of participants (analysed):** Intervention = 7, Control = 9 **Description of intervention:** "Families in both groups attended weekly, small-group sessions with the researchers where baseline measures were taken and family-based nutrition education was delivered." Children in the intervention group were "given F&V in containers decorated with their favorite cartoon characters. In addition, a sticker was included inside each decorated container to simulate the practice of premiums used by the food industry; children were allowed to collect these stickers on a game board to cash in for a prize the following week." ***Duration:*** 7 weeks **Number of contacts:** Weekly group sessions and offered F&V containers 3 times a day **Setting:** Home + Lab **Modality:** Face-to-face **Interventionist:** Parents and researchers

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Keller 2012 *(Continued)*

	Integrity: No information provided **Date of study:** Unknown **Description of control:** "Children who were in the control group received F&V in plain plastic containers throughout the study"
Outcomes	**Outcome relating to children's fruit and vegetable consumption:** Child's consumption of fruit and vegetables (grams, servings per day). F&V containers were stored by parents throughout the study period and taken back to the lab to be weighed **Outcome relating to absolute costs/cost effectiveness of interventions:** Not reported **Outcome relating to reported adverse events:** Not reported **Length of follow-up from baseline:** 7 weeks **Length of follow-up post-intervention:** Immediately **Subgroup analyses:** None **Loss to follow-up:** Overall = 16% (not specified by group) **Analysis:** Unknown if sample size calculations performed.
Notes	First reported outcome (grams vegetables/week) was extracted for inclusion in the meta-analysis. Sensitivity analysis - primary outcome: Primary outcome not stated, fruit or vegetable intake only outcome reported

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	There is not enough information to determine the sequence generation
Allocation concealment (selection bias)	Unclear risk	There is not enough information to determine allocation concealment
Blinding of participants and personnel (performance bias) All outcomes	Low risk	The outcome is objective consumption of fruit & veg which is unlikely to be influenced by lack of participant & personnel blinding

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Keller 2012 *(Continued)*

Blinding of outcome assessment (detection bias) All outcomes	Low risk	Objective assessment (weight) of fruit and vegetable consumption therefore low risk
Incomplete outcome data (attrition bias) All outcomes	High risk	16/19 (84%) children completed the 7-week study, however 3 children were excluded from the analysis. Intention-to-treat analysis was not used, therefore high risk of bias
Selective reporting (reporting bias)	Unclear risk	There is not enough information to determine if there is any reporting bias
Other bias	Low risk	Contamination bias that could threaten the internal validity is unlikely to be an issue

Kim 2018

Methods	**Study design:** Cluster-randomised controlled trial **Funding:** *"there has been no significant financial support for this work that could have influenced its outcome."*
Participants	**Description:** Children aged 2-5.5 years with confirmed autism spectrum disorder (ASD) attending applied behaviour analysis (ABA) early intervention agencies for children **N (Randomised):** 5 agencies, 35 children **Age:** Child (mean): intervention = 4.4 years, control = 4.0 years **% Female:** Child: intervention = 15%, control = 7% **SES and ethnicity:** Not reported **Inclusion/exclusion criteria:** *"inclusion criteria: 1) aged between two and five and a half years, 2) confirmed ASD diagnosis via parental report, 3) reported no extreme food restrictions or medical conditions impeding any kind of food consumption, and 4) received no additional feeding-related interventions"* **Recruitment:** *"Participants were recruited via five ABA early intervention agencies for children with ASD located in the metropolitan area of Seoul, Korea."* **Recruitment rate:** Unknown **Region:**

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Kim 2018 *(Continued)*

	Seoul (Korea)
Interventions	**Number of experimental conditions:** 2 **Number of participants (analysed):** Intervention = 13, control = 14 **Description of intervention:** *"The exposure program was administered as one of the ABA curriculum activities. The therapists and assistants (hereafter referred to as 'staff') were instructed to conduct a 5–10 min activity designed for a one-week basis, one activity a day, for four days a week. The one-week activity set—comprising four different activities—was repeated for four weeks in a month until a new one-week activity set was started the next month."* *"The final program consisted of 24 play activities, grouped into three levels by the degree of exposure, which was determined based on the time of contact, as well as the size and number of the stimuli. Each activity was repeated four times with three different vegetable and the expected time of contact, as well as the number of vegetables, had increased along with the level process."* **Duration:** 6 months **Number of contacts:** 96 sessions **Setting:** Early intervention agencies **Modality:** Face-to-face **Interventionist:** Therapists and assistants **Integrity:** "*The first author and an undergraduate research assistant checked treatment fidelity using a 7-item checklist on a regular basis (twice a week) during agency visits. Interrater agreement for treatment fidelity ranged from 85% to 100%."* **Date of study:** Unknown **Description of control:** *"In this study, the control group received their usual treatment. The training manual was provided to the control group after the completion of this study."*
Outcomes	**Outcome relating to children's fruit and vegetable consumption:** Child's consumption of vegetables (pieces) assessed by staff counting the number of pieces consumed **Outcome relating to absolute costs/cost-effectiveness of interventions:** Not reported **Outcome relating to reported adverse events:**

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Kim 2018 *(Continued)*

Not reported

Length of follow-up from baseline:

6 months

Length of follow-up post-intervention:

Immediate

Subgroup analyses:

None

Loss to follow-up (at immediate)

Overall: 23% (8/35)

Analysis:

Unknown if adjusted for clustering

Sample size calculation not performed

"The biggest limitation of this study is the small sample size and the selection of participants using convenient sampling method."

Notes

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Agencies were randomly assigned to either the exposure or control No further information provided
Allocation concealment (selection bias)	Unclear risk	No information provided
Blinding of participants and personnel (performance bias) All outcomes	Low risk	Objective measure of child's vegetable intake and unlikely to be influenced by performance bias
Blinding of outcome assessment (detection bias) All outcomes	Low risk	The experimenter recorded the number of pieces of each food item taken by the child and it is unlikely that this would be influenced by detection bias
Incomplete outcome data (attrition bias) All outcomes	High risk	Overall loss to follow-up is: 8/35 (23%), no ITT reported
Selective reporting (reporting bias)	Unclear risk	Unclear, no protocol, trial registration
Other bias	High risk	Recruitment bias (low risk): the parents were blind to the group assignment to avoid confounding variables Baseline imbalance (high risk): from demographic table appears to be no imbalance between groups. However, in table 3 the consumption of vegetable in

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Kim 2018 *(Continued)*

	the exposure group looks significantly higher which trial authors don't report accounting for Loss of clusters (low risk): all clusters analysed Incorrect analysis (low risk): no clustering adjustment reported. The review authors adjusted for in the meta-analysis Contamination bias (low risk): agencies at different locations

Kling 2016

Methods	**Study design:** Cluster-randomised controlled trial – cross-over **Funding:** *"Supported by NIH Grant R01-DK082580 and USDA National Institute for Food and Agriculture Grant 2011-67001-30117 Program A2121-Childhood Obesity Prevention: Transdisciplinary Graduate Education and Training in Nutrition and Family Sciences"*
Participants	**Description:** Children aged 3-6 years enrolled in 3 childcare centres near University Park, Pennsylvania **N (Randomised):** 11 classrooms, 31 children **Age:** Overall mean = 4.4 years **% Female:** 49% **SES and ethnicity:** "Based on the 106 parents (88%) who provided family information, household incomes and education levels were above average: 69% of households had an annual income of above $50,000 and 92% of mothers and 90% of fathers had a Bachelor's degree or higher." "The sample of children was 69% white, 21% Asian, 3% black or African American, and 7% of mixed or another race; 4% were of Hispanic or Latino origin." **Inclusion/exclusion criteria:** Inclusion criteria: children had to be enrolled in participating childcare centres Exclusion criteria: children with an allergy or intolerance to the foods or milk being served **Recruitment:** "Children were recruited by giving letters to parents with 3- to 6-year-old children enrolled at three childcare centers near University Park, PA." **Recruitment rate:** Unknown **Region:**

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Kling 2016 *(Continued)*

	Pennsylvania, USA
Interventions	**Number of experimental conditions:** 6 **Number of participants (analysed):** Overall = 120 **Description of intervention:** Across the 6 meals (groups), all foods and milk were served at 3 levels of portion size (100%, 150%, or 200% of reference amounts) and 2 levels of energy density (100% or 142%) and were consumed ad libitum" "The experimental meal consisted of chicken (grilled breast or breaded nuggets), macaroni and cheese, a green vegetable (broccoli or peas), applesauce, ketchup, and milk." **Duration:** 6 weeks **Number of contacts:** 6 (1 meal/week) **Setting:** Preschool **Modality:** Face-to-face **Interventionist:** Teachers and undergraduate research assistants **Integrity:** No information provided **Date of study:** "enrolled in the study from May 2013 to July 2014." **Description of control:** N/A
Outcomes	**Outcome relating to children's fruit and vegetable consumption:** Consumption of vegetables (grams): "To determine the amount consumed, all foods and beverages were weighed before and after the meal in a separate room out of the children's view. Food weights were recorded to the nearest 0.1 g using digital scales" **Outcome relating to absolute costs/cost-effectiveness of interventions:** Not reported **Outcome relating to reported adverse events:** Not reported **Length of follow-up from baseline:** 6 weeks

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Kling 2016 *(Continued)*

Length of follow-up post-intervention:

Immediately

Subgroup analyses:

None

Loss to follow-up:

Overall: 8% (11/131)

Analysis:

Unknown if adjusted for clustering

Sample size calculations performed

Notes

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	"The order of the six conditions was counterbalanced across classrooms using Latin squares, and classrooms were randomly assigned one of the condition sequences using a random number generator."
Allocation concealment (selection bias)	Unclear risk	There is no information provided about allocation concealment and therefore it is unclear if allocation was concealed from those conducting the research.
Blinding of participants and personnel (performance bias) All outcomes	Low risk	"Neither parents nor children were informed about the purpose of the study." "During each meal, adults, including teachers and undergraduate research assistants who did not know the purpose of the study, were instructed to redirect conversations about food-related topics to minimize peer influence on children's lunch intake."
Blinding of outcome assessment (detection bias) All outcomes	Low risk	"During each meal, adults, including teachers and undergraduate research assistants who did not know the purpose of the study" low risk. Researchers who weighed all food and drink before and after the meal. Researchers were blinded to the purpose of the study.
Incomplete outcome data (attrition bias) All outcomes	Low risk	"A total of 131 children from 11 classrooms at the 3 childcare centers were enrolled in the study from May 2013 to July 2014. Eleven children were excluded from the analysis because they were absent for 3 or more of the 6 experimental meals. Thus, intake data was analyzed for 120 children (61 boys and 59 girls)." No attrition is reported.
Selective reporting (reporting bias)	Low risk	All proposed outcomes in trial registry are reported.
Other bias	Low risk	No other bias was identified

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Kobel 2019

Methods	**Study design:** Cluster-randomised controlled trial **Funding:** *"The kindergarten-based health promotion programme "Join the Healthy Boat" and its evaluation study was financed by the Baden-Württemberg Foundation (grant number BWS_1.479.00_2009)"*
Participants	**Description:** Children attending kindergartens in southwest Germany **N (Randomised):** 57 kindergartens, 973 children **Age:** Child (mean): both groups = 3.6 years **% Female:** Child: Intervention = 44%, control = 53% **SES and ethnicity:** Migration background (%) Intervention = 31%, control = 37% **Inclusion/exclusion criteria:** Kindergarten: *"Only kindergartens which have not previously taken part in the programme were included in the study."* Children: *"Children within the recruited kindergartens were eligible if they were between three and five years old at the time of baseline measurements and their parents provided a signed consent form."* **Recruitment:** *"Participating kindergartens were recruited from all kindergartens in southwest Germany, which have received written information about programme and study, asking interested kindergarten teachers to participate."* **Recruitment rate:** Unknown **Region:** Southwest Germany
Interventions	**Number of experimental conditions:** 2 **Number of participants (analysed):** Intervention = 318, control = 240 **Description of intervention:** *"Join the Healthy Boat" is a Kindergarten-based, teacher centered health promotion programme which aims at a healthy lifestyle of kindergarten children and supports among others the prevention of overweight and obese children.""The three key topics of the programme are the promotion of physical activity,*

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Kobel 2019 *(Continued)*

the reduction of screen media consumption, and a more healthy diet including the reduction of sweetened drinks and an increased fruit and vegetable intake."

Intervention materials included activities and games, lessons, family homework, materials for parents and instructional and behavioural education materials for teachers

Duration:

1 year

Number of contacts:

Unclear, multilevel multicomponent programme

Setting:

Kindergarten

Modality:

Multiple (face-to-face, written materials, educational resources, family homework, parental resources)

Interventionist:

Teachers

Integrity:

No information provided

Date of study:

Autumn 2016-Autumn 2017

Description of control:

"the control group followed the regular kindergarten life with no contact during that year."

Outcomes	**Outcome relating to children's fruit and vegetable consumption:** Child's consumption of fruits and vegetables (portions/day) assessed using a parental questionnaire based on the German Health Interview and Examination Survey for Children and Adolescents (KiGGS) **Outcome relating to absolute costs/cost-effectiveness of interventions:** Not reported **Outcome relating to reported adverse events:** Not reported **Length of follow-up from baseline:** 1 year **Length of follow-up post-intervention:** Immediate **Subgroup analyses:** None **Loss to follow-up (at immediate)** Overall: 43% (415/973)

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Kobel 2019 *(Continued)*

	Analysis: Unknown if adjusted for clustering Sample size calculation performed
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	From protocol - "to ensure a similar number of children in intervention and control group, stratification of randomisation was carried out on three levels on the basis of kindergarten size, that is, kindergartens with ≤ 15 participating children, with 16–25 participating children, and with > 25 participating children" No further information about sequence generation process
Allocation concealment (selection bias)	Unclear risk	No information provided
Blinding of participants and personnel (performance bias) All outcomes	High risk	Teachers were not blinded. Materials were also provided to the parents in the intervention group. Child intake parent-reported, likely to influence performance
Blinding of outcome assessment (detection bias) All outcomes	High risk	Does not report if parents were aware of intervention allocation, child intake parent-reported, likely to influence detection bias
Incomplete outcome data (attrition bias) All outcomes	High risk	43% loss to follow-up, no ITT reported
Selective reporting (reporting bias)	High risk	Change in variables for nutrition (consumption of sugar-sweetened beverages, fruit, vegetables, high-calorie food; all variables are ordinal), change in child's time spent with screen media, change in child's physical activity/energy expenditure (physical activity: dichotomous, energy expenditure: continuous variables), change in health knowledge and attitude of parents and kindergarten teachers (nominal/ordinal variables) Trial authors did not report high-calorie food, energy expenditure or parent outcomes
Other bias	Unclear risk	Recruitment bias (unclear risk): schools were randomised and then parents asked for consent, although unclear if parents were made aware of allocation Baseline imbalance (unclear risk): some baseline imbalance, accounted for in the follow-up analysis Loss of clusters (low risk): no loss of clusters Incorrect analysis (low risk): not adjusted for clustering. The review authors adjusted for in the in meta-analysis. Contamination bias (low risk): group allocation different schools

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Kristiansen 2019

Methods	**Study design:** Cluster-randomised controlled trial **Funding:** *"The Research Council of Norway (project number 228452) with supplementary funds from the Throne Holst Nutrition Research Foundation, University of Oslo, supported this work."*
Participants	**Description:** Preschool children with year of birth 2010 and 2011, attending public or private kindergartens in the counties of Vestfold and Buskerud, Norway **N (Randomised):** 73 kindergartens, 633 children **Age:** Child (year of birth) 2010: both groups = 52%; 2011: both groups = 48% **% Female:** Child: intervention = 51%, control = 52% **SES and ethnicity:** Education: High (university college/university): intervention = 67%, control = 70% **Inclusion/exclusion criteria:** Inclusion/exclusion criteria not explicitly stated. Kindergartens: public or private with at least 10 children attending who were born in 2010 or 2011, excluded family-based Kindergartens. Parents: able to read and write Norwegian and have access to the internet **Recruitment:** *"All regular kindergartens (n 479) in the two counties were invited by letter followed-up by a phone call"* Parental consent obtained (approach not specified) **Recruitment rate:** Kindergarten: 15% (73/479) Child: 39% (633/1631) **Region:** Vestfold and Buskerud (Norway)
Interventions	**Number of experimental conditions:** 2 **Number of participants (analysed):** Intervention = 137, control = 160 **Description of intervention:**

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Kristiansen 2019 *(Continued)*

Multiple intervention components aimed to improve children's vegetable consumption both at home and in the kindergarten focused at influencing availability, accessibility, encouragement and role modelling. Each kindergarten received a 1-day inspirational course, which included practical training, theoretical session, action plans, materials and resources (both practical and written) for kindergarten and families, and access to a website and closed Facebook group.

Duration:

6 months

Number of contacts:

Unclear (1-day workshop, resources, website and Facebook group, booster activities)

Setting:

Kindergarten + home

Modality:

Multiple (face-to-face, materials/resources, online)

Interventionist:

Multiple: cook, principal investigator, post-doc/PhD, kindergarten staff

Integrity:

Fidelity: *"it is also likely that there was considerable variation in how the intervention was implemented."*

Date of study:

September 2015-February 2016

Description of control:

"The control kindergartens and families continued as normal for the duration of the study and participated only by providing data, however they were offered access to the intervention website resources in September 2017."

Outcomes

Outcome relating to children's fruit and vegetable consumption:

Child's consumption of vegetables assessed using 24-h recall when at home (completed by parents) and direct observation when in kindergarten

Outcome relating to absolute costs/cost-effectiveness of interventions:

Not reported

Outcome relating to reported adverse events:

Not reported

Length of follow-up from baseline:

12 months

Length of follow-up post-intervention:

2-4 months

Subgroup analyses:

None

Loss to follow-up (at 2-4 months)

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Kristiansen 2019 *(Continued)*

Intervention: 56%

Control: 50%

Analysis:

Adjusted for clustering

Sample size calculation performed

Notes

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	An external statistician conducted a stratified block randomisation in order to produce an equal distribution of kindergartens within ownership (public and private) in the 2 groups and total number of participating children in each group.
Allocation concealment (selection bias)	Unclear risk	There is no information provided about allocation concealment and therefore it is unclear if allocation was concealed.
Blinding of participants and personnel (performance bias) All outcomes	High risk	There is no indication whether participants were blind to group allocation and researchers were not blinded to intervention group. Given the nature of the intervention, at high risk of performance bias.
Blinding of outcome assessment (detection bias) All outcomes	High risk	Child vegetable frequency and variety (parent self-reported survey) There is no mention that participants were blinded to group allocation and therefore the risk of detection bias for this parent self-reported measure is high.
Incomplete outcome data (attrition bias) All outcomes	High risk	50% of children in the control group and 56% in the intervention group were lost to follow-up, no ITT reported
Selective reporting (reporting bias)	Low risk	The outcomes reported align with those listed in the trial registration.
Other bias	Unclear risk	Recruitment bias (low risk): participants were recruited prior to randomisation Baseline imbalance (unclear risk): significantly more children in the intervention group attended a public kindergarten than children in the control group. Children in the intervention group had a significantly higher frequency and variety of vegetable intake at baseline compared to children in the control group. However these baseline imbalances were accounted for in the analysis. Loss of clusters (low risk): no loss of clusters reported Incorrect analysis (low risk): adjusted for clustering Contamination bias (low risk): kindergartens were stratified and randomised to condition so risk of contamination is low.

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Lanigan 2017

Methods	**Study design:** Randomised controlled trial - cross-over **Funding:** *"This project was funded by a Washington State University College of Agricultural, Human, and Natural Resource Sciences Research Initiative for Human Sciences Grant."*
Participants	**Description:** Children aged 3-6 years in 2 early childhood education centres located in the Northwestern USA **N (Randomised):** 98 children **Age:** Child: overall = 55 months (not specified by group) **% Female:** Child: overall = 51% (not specified by group) **SES and ethnicity:** Parent: *"from middle- to upper-income homes (51% earned > $74,000/y), with highly educated parents (67% from homes with parents who had a bachelor's degree or higher)."* Child: 67% were white **Inclusion/exclusion criteria:** Not specified **Recruitment:** Teachers: *"Teachers who volunteered to have their classroom participate in the study received a $100 gift card (n = 5)."* Parents: *"A letter and consent form were sent to all families (n = 121) of children in participating classrooms."* **Recruitment rate:** 81% (98/121) **Region:** Northwestern USA
Interventions	**Number of experimental conditions:** 2 **Number of participants (analysed):** 87 **Description of intervention:** *"Two days per week during the 6-week intervention, trained RAs [research assistants] operated a tasting station in the classroom. The children who participated in the intervention visited the tasting station individually and were offered 1 food to taste."* *"On the CCNP + RE (child-centered nutrition phrases + repeated exposure) day, the RA integrated the food-specific phrases into the conversation 2 times as the tasting was conducted"*

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Lanigan 2017 *(Continued)*

"On the RE day, the RA engaged in general non−food related conversation."

Duration:

6 weeks

Number of contacts:

12 (twice/week)

Setting:

Preschool

Modality:

Face-to-face

Interventionist:

Trained research assistants

Integrity:

No information provided

Date of study:

Unknown

Description of control:

N/A

Outcomes	**Outcome relating to children's fruit and vegetable consumption:** Child's consumption of vegetables (grams). *"The researchers measured food intake by the child using a plate waste assessment method. Food containers were weighed (in grams) after the meal to determine intake"* **Outcome relating to absolute costs/cost-effectiveness of interventions:** Not reported **Outcome relating to reported adverse events:** Not reported **Length of follow-up from baseline:** 6 and 10 weeks **Length of follow-up post-intervention:** Immediate and 1 month **Subgroup analyses:** None **Loss to follow-up (at immediate and 1 month)** Overall = 11% **Analysis:** Sample size calculation not performed

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Lanigan 2017 *(Continued)*

"The small sample likely limited the power of the study to detect differences."

Notes

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Randomly assigned to condition using a coin toss
Allocation concealment (selection bias)	Unclear risk	There is no information provided about allocation concealment and therefore it is unclear if allocation was concealed.
Blinding of participants and personnel (performance bias) All outcomes	Low risk	Objective measure of child's healthful food consumption and unlikely to be influenced by performance bias
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Food was weighed to determine consumption and it is unlikely to be influenced by whether the researchers were blinded to condition.
Incomplete outcome data (attrition bias) All outcomes	Low risk	Of 98 families who agreed to participate 87 children completed the study (88%), no ITT reported
Selective reporting (reporting bias)	Unclear risk	There is no study protocol therefore it is unclear if there was selective outcome reporting.
Other bias	Low risk	Cross-over design, low risk of contamination bias

Martinez-Andrade 2014

Methods

Study design:

Cluster-randomised controlled trial

Funding:

Not reported

Participants

Description:

Children aged 2 to 5 years at 4 primary care clinics and their parent

N (Randomised):

4 primary care clinics, 306 children

Age:

Child (mean): Intervention = 40.1 months, Control = 41.1 months

Parent (mean): Intervention = 29.3 years, Control = 29.5 years

% Female:

Child: 47%

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Martinez-Andrade 2014 *(Continued)*

Parent: not specified

SES and ethnicity:

Education: no schooling = 0.3%, Primary school = 8.9%, Junior high = 33.7%, High school = 39.3%, Professional school – 12.5%, Postgraduate = 1.7%

Inclusion/exclusion criteria:

Inclusion criteria: "Participants comprised children aged 2 - <5 years of age whose BMI (calculated as weight in kilograms divided by height in meters squared) was above the median for age and sex (BMI z-score 0 - 3); who attended one of the participating IMSS clinics during the recruitment period for pediatric care, vaccination, or accompanying a family member; and whose parent or caregiver gave written consent to participate."

Exclusion criteria: "Families were excluded if they planned to move residences or change primary care clinics during the study period; the child had motor limitations (e.g., physical disability or delay); or required a special diet by medical indication."

Recruitment:

"The project manager approached the directors of the 6 primary care clinics in Mexico City with the greatest proportion of preschoolers (approximately 5% children <5 years) to request their support for the project."

Recruitment rate:

Primary care clinic = 67% (4/6)

Child = 10% (306/3095) (using number of participants approached as denominator)

Region:

Mexico City

Interventions

Number of experimental conditions: 2

Number of participants (analysed):

Intervention = 99, control = 102

Description of intervention:

Intervention participants received a 6-week curriculum focused on obesity awareness and prevention. 5 aspects dealt with throughout the 6 sessions: 1) Dietary culture, risk-benefit practices; 2) The process of feeding acquisition/preparation/service/eating behaviours; 3) Physical activity habits; 4) Importance of weighing/measuring oneself and its meaning; 5) feedback and evaluations

Duration:

6 weeks

Number of contacts:

6 sessions (2 hrs a session)

Setting:

Primary care clinics

Modality:

Face-to-face, group sessions

Interventionist:

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Martinez-Andrade 2014 *(Continued)*

	Nutritionist, nurse and health educator **Integrity:** Delivery of intervention: "To ensure fidelity, a small group of study staff (nutritionist, nurse and health educator) administered all intervention sessions and completed all screening, baseline and follow-up assessments. No quantitative measure of delivery of intervention components" Attendance: "Only 52% (88 of the 168 who agreed to participate) attended ≥ 1 educational session (405 sessions attended in total). The total number of expected attendances at educational sessions was 1008 (168 participants attending 6 sessions each). Thus, compliance in the intervention group was 40% (405/1008) of total expected attendances. However, of the 88 receiving any intervention content, 67% (59/88) attended 5-6 of the intended 6 workshops" **Date of study:** March 2012 to April 2013 **Description of control:** Usual-care control - received no intervention
Outcomes	**Outcome relating to children's fruit and vegetable consumption:** Child's consumption of fruits and vegetables (servings per week), "staff assisted parents in completing a child Food Frequency Questionnaire (FFQ) adapted from the FFQ used to assess dietary intake among 1-4 year old children in the 2006 Mexican National Nutrition Survey." **Outcome relating to absolute costs/cost effectiveness of interventions:** Not reported **Outcome relating to reported adverse events:** Not reported **Length of follow-up from baseline:** 3 and 6 months **Length of follow-up post-intervention:** 1½ and 4½ months **Subgroup analyses:** None **Loss to follow-up (at 1 ½ and 4 ½ months):** Intervention = 41%, 35% Control = 26%, 26% **Analysis:** Adjusted for clustering Unknown if sample size calculation was performed
Notes	First reported outcome (fruit servings/week) at the longest follow-up < 12 months (3 months after intervention completion - as 6-months follow-up did not report retention values by group) was extracted for inclusion in meta-analysis

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Martinez-Andrade 2014 *(Continued)*

The reported estimate which adjusted for clustering assessed change from baseline, we therefore used post-intervention data and calculated an effective sample size using ICC of 0.016 to enable inclusion in meta-analysis

Sensitivity analysis - primary outcome: Fruit or vegetable intake listed as primary outcome

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	A computer-generated randomisation list designed by a statistician with no connection to the intervention was used for random allocation to experimental group
Allocation concealment (selection bias)	Unclear risk	There is no information provided about allocation concealment and therefore it is unclear if allocation was concealed
Blinding of participants and personnel (performance bias) All outcomes	High risk	Child dietary intake (parent-reported): "Only after informed consent did participants learn of their treatment assignment". There is no blinding to group allocation of participants at follow-up described and this is likely to influence performance
Blinding of outcome assessment (detection bias) All outcomes	High risk	Child dietary intake (parent reported): "Only after informed consent did participants learn of their treatment assignment". There is no blinding to group allocation of participants at follow-up described and because self-reported measures were used this is likely to influence detection bias
Incomplete outcome data (attrition bias) All outcomes	High risk	"Non-participation was greater in the intervention (75 (45%) of 168 participants) than in the usual care (42 (30%) of 138 participants) arm (Figure 1)." Attrition rate was high with >35% of families not completing follow-up at 3 months. Multiple imputations were performed to address missing data however non-participation was greater in the intervention than in the usual care condition
Selective reporting (reporting bias)	Low risk	The primary outcomes reported in the paper align with those specified in the trial registration
Other bias	Unclear risk	There were baseline imbalances between the groups, but results were adjusted. Unclear risk of recruitment bias as individuals were recruited to the trial after clusters have been randomised

Mennella 2008

Methods	**Study design:** Randomised controlled trial **Funding:**

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Mennella 2008 *(Continued)*

	Not reported
Participants	**Description:** Children aged 4 to 9 months and their mother **N (Randomised):** 88 parent-children dyads **Age:** Child (mean): Study 1 fruits = 6.7 months, Study 2 vegetables = 6.3 months Mother (mean): Study 1 fruits = 29 years, Study 2 vegetables = 28 years **% Female:** Child: Study 1 fruits = 49%, Study 2 vegetables = 43% Parent: 100% **SES and ethnicity:** Parent: "Their ethnic background was 55.4% (N =41) Black; 29.7% (N =22) White; 2.7% (N =2) Hispanic and 12.2% (N =9) Other/Mixed Ethnicity." SES not specified **Inclusion/exclusion criteria:** "To qualify the Children had to have at least two weeks of experience eating cereal or fruit from a spoon and little experience with the target fruits and vegetables." **Recruitment:** "Seventy-four mothers whose Children were between the ages of 4 and 9 months were recruited from advertisements in local newspapers and from Women, Children and Children Programs in Philadelphia, PA." **Recruitment rate:** Not specified **Region:** Philadelphia (USA)
Interventions	**Number of experimental conditions:** 5 **Number of participants (analysed):** Study 1: fruits Pear group = 20 dyads, between-meal (BM) group = 19 dyads Study 2: vegetables Green bean group = 11 dyads, between-meal (BM) group = 12 dyads, between-meal and within-meal (BM-WM) group = 12 dyads **Description of intervention:** Study 1: fruits

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Mennella 2008 *(Continued)*

"During the home exposure period, one group fed only pears at the target meal (Pear Group, N=20) whereas the other group fed a fruit which was different than the one experienced during the previous 2 days (Between-Meal (BM) Fruit Variety Group, N=19)."

Study 2: vegetables

"The three groups differed in the type, amount and variety of foods that infants were fed during the target meal during the 8-day home exposure period. The infants in the Green Bean Group (N=11) were fed only the target vegetable, green beans, whereas those in the Between-Meal variety group (BM Vegetable Variety Group, N=12) and the Between-Meal and Within-Meal Variety Group (BM–WM Vegetable Variety Group, N=12) were fed a variety of vegetables. The BM Variety Group was fed only one vegetable each day and green and orange vegetables were alternated daily, whereas the BM–WM Variety Group was fed two vegetables each day (one green, one orange). In the latter group, the pair of vegetables varied from day-to-day but one of the pair was experienced the prior day."

Duration:

8 days

Number of contacts:

8 exposures

Setting:

Home

Modality:

Face-to-face

Interventionist:

Mothers

Integrity:

"All of the mothers complied with these instructions."

Date of study:

Unknown

Description of control:

N/A

Outcomes

Outcome relating to children's fruit and vegetable consumption:

Child's consumption of fruit and vegetable purees (grams). Mother resealed jars and returned them after the exposure period to be weighed

Outcome relating to absolute costs/cost effectiveness of interventions:

Not reported

Outcome relating to reported adverse events:

Not reported

Length of follow-up from baseline:

12 days (4 days of test food(s))

Length of follow-up post-intervention:

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Mennella 2008 *(Continued)*

2 days

Subgroup analyses:

None

Loss to follow-up:

Condition 1: fruits

Overall = 15% (no specified by group)

Condition 2: vegetables

Overall = 17% (no specified by group)

Analysis:

Unknown if sample size calculation was performed.

Notes

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Randomly allocated to experimental group but the random sequence generation procedure is not described
Allocation concealment (selection bias)	Unclear risk	There is no information provided about allocation concealment and therefore it is unclear if allocation was concealed
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Fruit & vegetable intake: The mother fed the child and there is no mention of blinding, therefore at unclear risk of performance bias
Blinding of outcome assessment (detection bias) All outcomes	Low risk	The mother fed the child and there is no mention of blinding. However, this is an objective measure of intake, and therefore low risk of detection bias
Incomplete outcome data (attrition bias) All outcomes	High risk	Mother-infant pairs were excluded from the study because they did not comply with experimental procedures or ate less than 5 grams on the testing days. An intention-to-treat approach was not adopted and therefore at high risk of attrition bias
Selective reporting (reporting bias)	Unclear risk	There is no study protocol therefore it is unclear if there was selective outcome reporting
Other bias	Low risk	Contamination bias that could threaten the internal validity is unlikely to be an issue

Namenek Brouwer 2013

Methods

Study design:

Cluster-randomised controlled trial

Funding:

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Namenek Brouwer 2013 *(Continued)*

	Not reported
Participants	**Description:** Children and centre directors from 4 licensed childcare centres in North Carolina **N (Randomised):** 4 childcare centres **Age:** < 3 years = 27% 3 to 5 years = 73% **% Female:** Child: not specified Directors: 100% **SES and ethnicity:** "All centers had at least some subsidized children enrolled." Directors: "75% were African American, and 50% had a college degree." **Inclusion/exclusion criteria:** "To participate in the study, centers had to provide all foods and beverages to children in care (i.e., parents could not send food from home), not have an open case of abuse or neglect with the state licensing agency, and have at least three children between the ages of three and five years in care on a regular basis." **Recruitment:** "We mailed a letter of invitation to every licensed center (n = 6) in the city limits of a small community near our research offices. The letter was followed by a telephone call from the study team. We enrolled the first four centers that agreed to participate. Center directors provided written informed consent to participate in the study; parents were provided a fact sheet describing the study and were asked to contact the project director if they did not want their children observed during the dietary assessment." **Recruitment rate:** 100% of centres; recruitment rate for children not reported **Region:** Central North Carolina (USA)
Interventions	**Number of experimental conditions:** 2 **Number of participants (analysed):** 4 childcare centres, "An average of 19.0 (7.9) children were enrolled per center" **Description of intervention:** "The Watch Me Grow program is a garden-based intervention aimed to increase the number of vegetables and fruits provided to and consumed by children in child care. The intervention took place in spring 2011. The program includes a "crop-a-month" structured curriculum for child-care providers, consultation by a gardener, and technical assistance from a health educator. Over the course of the four-month-long intervention, providers and children in the intervention centers grew (1) lettuce, (2) strawberries, (3) spinach, and (4) broccoli. We designed the garden to yield one crop per month, and

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Namenek Brouwer 2013 *(Continued)*

provided classrooms in the intervention centers with corresponding curriculum materials highlighting the target fruit or vegetable of the month."

Duration:

4 months

Number of contacts:

Health educators (technical assistance): monthly

Visits from study gardener: at least monthly

Centre staff provided curriculum activities: 1 activity per week

Setting:

Preschool

Modality:

Face-to-face

Interventionist:

Health educator/Gardener provided intervention to childcare centres

Centre Staff provided curriculum/activities to children

Integrity:

No information provided

Date of study:

2011

Description of control:

Received no intervention

Outcomes

Outcome relating to children's fruit and vegetable consumption:

Child's consumption of fruits and vegetables (mean servings, consumed by 3 children in each centre). Registered dietitians observed all meals and snacks over 2 full days and recorded all foods consumed for each of the 3 target children

Outcome relating to absolute costs/cost effectiveness of interventions:

Not reported

Outcome relating to reported adverse events:

Not reported

Length of follow-up from baseline:

~ 5 months

Length of follow-up post-intervention:

1 month

Subgroup analyses:

None

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Namenek Brouwer 2013 *(Continued)*

	Loss to follow-up: N/A: "the same three children may not have been observed pre- to post-intervention." **Analysis:** Did not adjust for clustering Unknown if sample size calculation was performed
Notes	First reported outcome (daily vegetable servings consumed) was extracted for inclusion in meta-analysis. No adjustment was made for clustering; we therefore used post-intervention data and calculated an effective sample size using ICC of 0.014 to enable inclusion in meta-analysis Sensitivity analysis - primary outcome: Fruit or vegetable intake is primary outcome as in trial registry

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	"either the intervention or control condition on a 1:1 ratio, using the Research Randomizer (www.randomizer.org/form.htm)" The research randomiser was used to generate the random sequence
Allocation concealment (selection bias)	Unclear risk	There is no information provided about allocation concealment and therefore it is unclear if allocation was concealed
Blinding of participants and personnel (performance bias) All outcomes	Low risk	Dietary observation: A trained registered dietitian blinded to treatment group conducted the dietary assessments
Blinding of outcome assessment (detection bias) All outcomes	High risk	Dietary observation: The outcome is observation of foods served and consumed at mealtimes at the childcare centre undertaken by blinded dietitians. However, there is no blinding of childcare centre staff, cooks, children etc., because they were provided with a garden at their centre, curriculum materials and lessons, and staff met with research team about the garden and how to incorporate it into all aspects of the centre
Incomplete outcome data (attrition bias) All outcomes	Low risk	Randomly selected a classroom and then 3 children within classroom at centres to observe pre- and post-intervention; it did not need to be the same 3 children observed pre- and post-intervention
Selective reporting (reporting bias)	Low risk	The primary outcomes reported in the paper align with those specified in the trial registration
Other bias	Unclear risk	"Due to sample size limitations, we did not conduct formal statistical analysis beyond comparing crude differences in mean servings of vegetables and fruits." Insufficient information was reported to determine whether childcare centres were similar at baseline or recruitment bias. No statistical method to account for clustering, but we calculated an effective sample size prior to inclusion in meta-analysis to account for this

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Natale 2014a

Methods	**Study design:** Cluster-randomised controlled trial **Funding:** *"This research was funded by the Miami-Dade County Children's Trust (grant number 764-287)."*
Participants	**Description:** Children aged 2 to 5 years enrolled in 8 subsidised childcare centres in Miami-Dade County, Florida **N (Randomised):** 8 childcare centres, 307 children **Age:** "the average age for boys was 3.82 years, the average age for girls was 3.91 years" **% Female:** Intervention = 49%, Control = 48% **SES and ethnicity:** "Thirty-six percent identified their child as black, 34% identified their child as white, 18% chose other, and 14% were unknown. The ethnicity of the sample mirrors that of Miami-Dade County, with 32% of the parents identifying their child as Hispanic/other, 25% as Hispanic/Cuban, 22% as African American, and 2% as Caucasian. Thirty-five percent of the sample were primarily Spanish speaking and completed the measures in Spanish, and 65% of the sample were primarily English speaking and completed the measures in English" **Inclusion/exclusion criteria:** "Center study inclusion criteria consisted of (a) serve >30 children, (b) serve low-income children, and (c) ethnic makeup had to be reflective of the county as a whole (minority majority). Low income was determined based on whether or not the child received subsidized child care." No inclusion/exclusion criteria specified for children. **Recruitment:** "All participants were recruited at the child care center. Parents were approached during drop-off or pickup times. Consent forms were attached to the interview packets, and parent data were collected during the initial visit." **Recruitment rate:** 98% **Region:** Miami-Dade County, Florida (USA)
Interventions	**Number of experimental conditions:** 2 **Number of participants (analysed):** Intervention = 238, Control = 69 **Description of intervention:**

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Natale 2014a *(Continued)*

Teacher curriculum: Modeled after a modified version of Hip-Hop to Health Jr., included implementation of lessons and a low-fat, high fibre diet that included more fruits and vegetables with an emphasis on cultural barriers.

Parent curriculum: Modeled after a modified version of the Eating Right Is Basic and Hip-Hop to Health Jr., included a monthly educational dinner (run by dietitians) in which nutrition and physical activity were discussed, monthly newsletters, and at-home activities, also information on how to introduce new foods and how to encourage eating more fruits and vegetables. Parents were encouraged to reduce TV viewing, increase physical activity, and model healthy eating behaviours for their child at home.

Centre-based modifications: These included: the development of policies to increase physical activity and healthy eating; modifying menus to make them compliant with the policies and also to ensure that the U.S. Department of Agriculture (USDA) nutritional requirements were met; agreeing on a drink policy that included providing water as the primary beverage, not allowing juice or sweetened beverages more than one time per week; changing from whole milk to 1% milk; having a snack policy which consisted of substituting healthy snacks, such as fresh fruit and/or vegetables, for cookies and other high-lipid snacks; having a physical activity policy to increase physical activity to more than one hour per day and to decrease TV viewing to less than 60 minutes two times a week.

Duration:

6 months

Number of contacts:

Unclear, multiple contacts

Setting:

Preschool, home

Modality:

Multiple (face-to-face, newsletters)

Interventionist:

Teachers, Parents and Registered Dieticians

Integrity:

No information provided

Date of study:

Unknown

Description of control:

“The Attention control group centers received a visit from an injury prevention education mobile. The mobile provided parents and teachers with hands-on safety education and information, as part of an ongoing injury prevention program at the University of Miami.”

Outcomes

Outcome relating to children's fruit and vegetable consumption:

Child’s consumption of fruit and vegetables assessed using a 16-item food frequency questionnaire (FFQ) completed by parents and teachers

Outcome relating to absolute costs/cost effectiveness of interventions:

Not reported

Outcome relating to reported adverse events:

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Natale 2014a *(Continued)*

	Not reported **Length of follow-up from baseline:** 3, 6 and 12 months **Length of follow-up post-intervention:** Immediately and 6 months **Subgroup analyses:** None **Loss to follow-up (Immediately post-intervention and 12 months):** Overall = 25%, 42% **Analysis:** Unclear if adjusted for clustering Unknown if sample size calculation performed
Notes	Sensitivity analysis - primary outcome: Primary outcome not stated, BMI 1st listed outcome

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Randomly allocated to experimental group but the random sequence generation procedure is not described
Allocation concealment (selection bias)	Unclear risk	There is no information provided about allocation concealment and therefore it is unclear if allocation was concealed
Blinding of participants and personnel (performance bias) All outcomes	High risk	Food intake: There is no blinding to group allocation of participants or personnel described and this is likely to influence performance
Blinding of outcome assessment (detection bias) All outcomes	High risk	Food intake (parent and teacher reported): There is no blinding to group allocation of participants or personnel described and this is likely to influence detection bias
Incomplete outcome data (attrition bias) All outcomes	High risk	Of the 318 child-parent dyads at baseline, there were 185 (58%) at the 1-year follow-up
Selective reporting (reporting bias)	Unclear risk	There is no study protocol therefore it is unclear if there was selective outcome reporting
Other bias	Unclear risk	Some evidence of baseline imbalance (e.g. ethnicity) Unclear recruitment bias Unclear whether potential clustering within childcare centres accounted for

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Nekitsing 2019a

Methods	**Study design:** Cluster-randomised controlled trial **Funding:** *"This research is funded by a White Rose Doctoral Training Centre (WRDTC) Economic and Social Research Council (ESRC) Collaborative Award. The collaborative partner is Purely Nutrition Ltd. Contribution in kind which includes storybooks and photo cards were received from the collaborative partner PhunkyFoods; Purely Nutrition Ltd."*
Participants	**Description:** Children aged 2-5 attending private preschools in West Yorkshire, UK **N (Randomised):** 12 preschools, 337 children **Age:** Child (mean): Group A = 39.6 months, Group B = 39.8 months, Group C = 37.7 months, Group D = 38.8 months **% Female:** Child: Group A = 54%, Group B = 39%, Group C = 46%, Group D = 40% **SES and ethnicity:** Not reported **Inclusion/exclusion criteria:** Preschool inclusion: *"Preschools were eligible to take part if they were able to integrate the study requirements into their curriculum over 2 weeks in November 2017."* No explicit exclusion criteria for preschools Children inclusion/exclusion criteria: *"Children were eligible to take part if they were aged 2 to 5 years and attended the preschool class on the celeriac intake assessment days. They were excluded from the study if they had any relevant food allergies, a medical condition that prevented them from eating the study vegetable, their parents did not want them to participate, or if the child indicated that they did not want to participate at the time of assessment"* **Recruitment:** *"Consent to participate was sought from the preschool man- ager at the cluster level and individually from parents using an opt-out approach in 11 preschools and opt-in approach in 1 preschool"* **Recruitment rate:** Preschool = 75% (12/16) Child = 98% (339/346) **Region:** West Yorkshire, UK
Interventions	**Number of experimental conditions:** 4 **Number of participants (analysed):** Group A = 59, Group B = 66, Group C = 65, Group D = 77

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Nekitsing 2019a *(Continued)*

Description of intervention:

"Over a 2-week period, children in all four conditions were read a vegetable storybook featuring celeriac or carrot. In addition, two conditions received sensory play with either carrot or celeriac added to the storybook method."

"The storybooks were specifically designed for the present study and were the main experimental stimuli."

"The staff were provided with a kit that included six different forms of celeriac or carrot, along with some instructions on how to use them for the sensory activity."

Group A (congruent storybook) and Group B (congruent storybook + congruent sensory play) learned about the unfamiliar 'target' vegetable (celeriac)

Group C (incongruent storybook) and Group D (incongruent storybook + incongruent sensory play) learned about a familiar vegetable (carrot)

Duration:

2 weeks (9 preschool days)

Number of contacts:

Unclear, 2 activities on the first and final day + staff requested to keep storybooks on clear acrylic stands to increase visual exposure and read the book a minimum of 5 times

Setting:

Preschool

Modality:

Face-to-face

Interventionist:

Preschool staff

Integrity:

"The researcher was present to observe preschool staff on days 1 and 15, as well as several interceding occasions, taking notes on delivery and compliance with the intervention. The story session lasted between 5 and 12 minutes, depending on the children's age, attention span, and interest in the story."

"staff were also asked to keep a register of attendance so that children who were absent during the story times could be identified. On average, individual children were read their story on five occasions (ranging from two to seven) and this did not vary by condition."

Date of study:

November 2017

Description of control:

N/A

Outcomes

Outcome relating to children's fruit and vegetable consumption:

Child's consumption of vegetables (celeriac, grams). *"Forty grams (1 of their "5 a day") of the celeriac was placed in clear snack bags then labeled for each child and weighed individually (to the nearest 0.01 g), before and after eating sessions using a digital scale (Mettler, PJ4000) by the researcher."*

Outcome relating to absolute costs/cost-effectiveness of interventions:

Not reported

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Nekitsing 2019a *(Continued)*

Outcome relating to reported adverse events:

Not reported

Length of follow-up from baseline:

2 weeks

Length of follow-up post-intervention:

Immediate

Subgroup analyses:

"In order to examine whether the intervention was effective specifically for those children who ate nothing at the baseline test (baseline non-eaters), a subgroup analysis was performed with 85 children who ate none of the celeriac at baseline."

Loss to follow-up (at immediate)

Group A = 31%, Group B = 15%, Group C = 24%, Group D = 13%

Analysis:

Adjusted for clustering

Sample size calculation performed

Notes

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Stratified randomisation was used and the random sequence was created using a random number generation function within Excel.
Allocation concealment (selection bias)	Unclear risk	There is no information provided about allocation concealment and therefore it is unclear if allocation was concealed.
Blinding of participants and personnel (performance bias) All outcomes	Low risk	Preschool managers and staff were unaware of the study design and condition assignment was concealed between clusters.
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Vegetable (celeriac) intake was measured in grams and therefore the risk of detection bias is low.
Incomplete outcome data (attrition bias) All outcomes	High risk	70/337 (21%) did not complete the post-intervention assessment, no ITT reported and so the risk of attrition bias is high
Selective reporting (reporting bias)	Low risk	The outcomes reported align with those outlined in the trial registration.
Other bias	Low risk	Recruitment bias (low risk): participants were recruited prior to randomisation Baseline imbalance (low risk): no between-group differences observed for baseline characteristics Loss of clusters (low risk): no clusters were lost to follow-up

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Nekitsing 2019a *(Continued)*

	Incorrect analysis (low risk): the analysis described is appropriate and adjusts for clustering. Contamination bias (low risk): preschools were randomised to condition so risk of contamination is low.

Nekitsing 2019b

Methods	**Study design:** Cluster-randomised controlled trial **Funding:** *"funded by a White Rose Doctoral Training Centre (WRDTC) Economic and Social Research Council (ESRC) Collaborative Award. The collaborative partner is Purely Nutrition Ltd. Contribution in kind, which includes storybooks and photo cards, were received from Purely Nutrition Ltd"*
Participants	**Description:** Children aged 2-5 years attending preschools in West Yorkshire, UK **N (Randomised):** 11 preschools, 219 children **Age:** Child (mean): taste exposure (TE) = 38.1 months, nutrition education (NE) = 43.4 months, TE + NE = 40.5 months, control = 41.8 months **% Female:** Child: TE = 51%, NE = 66%, TE + NE = 64%, control = 38% **SES and ethnicity:** No reported **Inclusion/exclusion criteria:** Inclusion criteria Preschool: *"Preschools were eligible to take part in the case that they were not participating in other nutrition health programs and were able to commit to the time frame of the study (9 months)."* Child: *"All children aged 2 to 5 years attending their preschool class on the agreed test day were included."* Exclusion criteria (child): *"They were excluded from the study in the case that they had any relevant food allergies, a medical condition that would prevent them from eating the test vegetable, or if their parents opted out of the study."* **Recruitment:** *"Fifty-five preschools from Leeds, Brighouse, and Halifax (West Yorkshire, UK) were sent a recruitment e-mail in July 2016, followed by a telephone call."* *"Consent to participate was sought from the preschool manager at the cluster level and individually by parents using an opt-out approach."* **Recruitment rate:**

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Nekitsing 2019b *(Continued)*

	Preschool = 20% (11/55) Child = 99% (220/223) **Region:** West Yorkshire (UK)
Interventions	**Number of experimental conditions:** 4 **Number of participants (analysed):** TE = 47, NE = 38, TE + NE = 39, control = 16 **Description of intervention:** Taste exposure: *"involved offering mooli during usual snack time once per week, every week for 10 weeks (Weeks 2 to 11)."* Nutrition education: for the NE clusters, preschool staff members were trained by the PhunkyFoods team to deliver the existing nutrition education programme, designed for preschool-aged children and provided preschools with ideas and inspiration for classroom carousel play activities (e.g. stories, role play, and games), practical food handling/preparation activities, educational displays for the classroom and parental involvement opportunities. *"For the NE clusters, staff members were instructed to teach two specific components of the PFP as often as possible during the 10-week period: Eat Well and Strive for 5!, then to record these activities on a checklist."* **Duration:** 10 weeks **Number of contacts:** TE: 10 (once/week) NE: unclear, *"staff members were instructed to teach two specific components of the PFP as often as possible during the 10-week period:"* **Setting:** Preschool **Modality:** Face-to-face **Interventionist:** Preschool staff **Integrity:** In total, 6 preschools using the PFP delivered ≥T 35% of the required contents (delivery of the intervention was 100% (n = 2), 50% (n = 2), 40% (n = 1), and 35% (n = 1). **Date of study:** September 2016-December 2017 **Description of control:** *"The control condition did not receive any intervention during the study period but were offered the education program on completion of the study (after Week 36)."*
Outcomes	**Outcome relating to children's fruit and vegetable consumption:**

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Nekitsing 2019b *(Continued)*

Child's consumption of mooli (grams). *"Each vegetable portion was weighed (to the nearest 0.01 g) before and after each snack time using a digital scale (Mettler PJ4000; Mettler-Toledo LLC) by the research team."*

Outcome relating to absolute costs/cost-effectiveness of interventions:

Not reported

Outcome relating to reported adverse events:

Not reported

Length of follow-up from baseline:

12, 14 and 36 weeks

Length of follow-up post-intervention:

Immediate, 12 and 24 weeks

Subgroup analyses:

"Analyses also undertaken only among those children classified as 'eaters' at baseline"

Loss to follow-up (at 24 weeks)

TE = 24%, NE = 44%, TE + NE = 29%, Control = 53%

Analysis:

Adjusted for clustering

Unclear if sample size calculation performed

"however the anticipated sample size was not fully met for the final analysis."

Notes

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Trial used stratified randomisation and created the random sequence using an online list generator.
Allocation concealment (selection bias)	High risk	The researcher generated the random allocation sequence for each preschool and so allocation judged as not being concealed
Blinding of participants and personnel (performance bias) All outcomes	Low risk	Condition allocation was concealed between clusters and so the risk of performance bias is low.
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Mooli intake was weighed in grams and so the risk of detection bias is low.
Incomplete outcome data (attrition bias) All outcomes	High risk	79/219 (36%) were lost to follow-up, no ITT reported and so the risk of attrition bias is high.

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Nekitsing 2019b *(Continued)*

Selective reporting (reporting bias)	Unclear risk	The primary outcome reported aligns with that outlined in the trial registration, however there is a secondary outcome (intake of usual vegetables) listed in the trial registration that does not appear to be reported in the paper.
Other bias	High risk	Recruitment bias (unclear risk): unclear if there is recruitment bias as preschool managers chose the day and time that was most convenient to them and thus which children would be included in the study. Baseline imbalance (high risk): there were no differences across intervention conditions in sex or mean BMI z-score but there were differences in mean age. Loss of clusters (low risk): no clusters were lost to follow-up. Incorrect analysis (low risk): the analysis described is appropriate and adjusts for clustering. Contamination bias (low risk): preschools were randomised to condition and allocation was concealed between clusters and so risk of contamination is low.

Nicklas 2017

Methods	**Study design:** Cluster-randomised controlled trial **Funding:** *"This study was sponsored by the National Institutes of Health (NIH)/National Institute of Child Health and Human Development through grant number R21-HD073608. Partial support was received from the USDA Agriculture Research Service through specific cooperative agreement 58-6250-0-008."*
Participants	**Description:** Preschool-aged children who were predominantly low-income African-American and Hispanic **N (Randomised):** 6 Head Start centres, 253 children **Age:** Mean: intervention = 4.47 years, control = 4.38 years **% Female:** Intervention = 49%, control = 52% **SES and ethnicity:** Hispanic: intervention = 46%, control = 54% African-American: intervention = 59%, control = 41% **Inclusion/exclusion criteria:** Not specified **Recruitment:** "Recruitment strategies included flyers that were sent to the home with the children, presentations at parent meetings, face-to-face recruitment during child drop-off and pickup at Head Start, and active involvement of the Head Start manager and staff in the recruitment process"

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Nicklas 2017 *(Continued)*

	Recruitment rate: Children: 65% (253/391) **Region:** Houston, TX (USA)
Interventions	**Number of experimental conditions:** 2 **Number of participants (analysed):** Intervention = 128, control = 125 **Description of intervention:** The intervention included 4 DVDs (videos) theatre-based puppet shows that aimed at persuading children to increase vegetable consumption through encouragement, rationale/reason, reinforcement, and role modelling that were delivered over 4 consecutive weeks at preschools. Additionally, "each intervention child took home a bag including the DVD video for that week, a pamphlet, main ingredients to prepare a simple vegetable snack, crayons, and a disposable camera (if parents did not have a smart phone) to use as instructed in the booklets." The intervention was “based on the theoretical framework “transportation into a narrative world”, three professionally developed characters, unique storylines and an engaging, repetitious song were incorporated in four 20-min videotaped puppet shows.” **Duration:** 4 weeks **Number of contacts:** 6 contacts/week **Setting:** Preschool, home **Modality:** Multiple (face-to-face, visual/audio – DVD) **Interventionist:** Teachers and parents **Integrity:** No information provided **Date of study:** Unknown **Description of control:** “During the 4-week intervention period the control group did not receive any alternate intervention.”
Outcomes	**Outcome relating to children's fruit and vegetable consumption:** Child’s consumption of vegetables assessed using digital photography and plate weight before and after consumption (grams) **Outcome relating to absolute costs/cost effectiveness of interventions:**

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Nicklas 2017 *(Continued)*

Not reported

Outcome relating to reported adverse events:

Not reported

Length of follow-up from baseline:

4 weeks + 2 days

Length of follow-up post-intervention:

2 days

Subgroup analyses:

None

Loss to follow-up:

No loss to follow-up

Analysis:

Adjusted for clustering

Unknown if sample size calculation performed

Notes	Reported estimates accounted for clustering, but confidence intervals or other measures of variance were not available. We therefore estimated means and SDs by groups at follow-up from a study figure using an online resource (Plot Digitizer: plotdigitizer.sourceforge.net) and calculated an effective sample size using ICC of 0.014 to enable inclusion in meta-analysis. Sensitivity analysis - primary outcome: primary outcome was vegetable consumption

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	The random sequence generation was not described
Allocation concealment (selection bias)	Unclear risk	No information about allocation concealment is provided and therefore it is unclear if allocation was concealed
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Participants and teachers in intervention preschools were not blinded to the intervention, as children viewed a DVD, and teachers were asked to identify the vegetable components served in the lunch. It is unclear whether this resulted in performance bias.
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Children's vegetable intake was assessed using the digital photography method and plates were weighed and therefore unlikely to be influenced by detection bias
Incomplete outcome data (attrition bias) All outcomes	Low risk	253 children were enrolled and all of them completed the follow-up assessment, so risk of attrition bias is very low.
Selective reporting (reporting bias)	Low risk	The primary outcomes reported in the paper align with those specified in the trial registration.

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Nicklas 2017 *(Continued)*

Other bias	Unclear risk	There is potential recruitment bias, as it is not clear when or how clusters were randomised, and whether recruitment occurred before or after.

O'Connell 2012

Methods	**Study design:** Cluster-randomised controlled trial – cross over **Funding:** *"Financial support was provided by the Rudd Foundation."*
Participants	**Description:** Children aged 3 to 6 years attending 2 private preschools in a small north-eastern city **N (Randomised):** 2 preschools (number of children not specified, 96 children recruited) **Age:** "Age ranged from 3 to 6 years old, but most (85%) children were 4 or 5 years old." **% Female:** 44% **SES and ethnicity:** "These preschools primarily serve highly educated households; nearly all (93%) of the children had at least one parent with a bachelor's degree and 75% had at least one parent with a graduate or professional degree." "Race/ethnicity was white (69%), Asian (8%), African American (5%), Hispanic (6%), and other (12%)." **Inclusion/exclusion criteria:** Not specified **Recruitment:** Not specified **Recruitment rate:** Unknown **Region:** New Haven (USA)
Interventions	**Number of experimental conditions:** 2 **Number of participants (analysed):** Intervention = 43, control = 53 **Description of intervention:**

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O'Connell 2012 *(Continued)*

"During the intervention, the children at Preschool A were served one of the new vegetables every day for 30 days in a 3-day cycle (e.g., Monday, cauliflower; Tuesday, snow peas; Wednesday, green pepper) until they had received each vegetable a total of 10 times."

Duration:

6 weeks

Number of contacts:

30 (1 per day for 30 days)

Setting:

Preschool

Modality:

Face-to-face

Interventionist:

Teachers

Integrity:

No information provided

Date of study:

2007

Description of control:

Control/delayed intervention (Preschool B). "

"Preschool B continued routine practices during the first 6 weeks of the study, and then switched conditions with Preschool A for the second 6 weeks"

Outcomes	**Outcome relating to children's fruit and vegetable consumption:** Child's consumption of new vegetables (grams). "Researchers picked up the bags of vegetables later from the schools, weighed them, and calculated intake to the nearest gram." **Outcome relating to absolute costs/cost effectiveness of interventions:** Not reported **Outcome relating to reported adverse events:** Not reported **Length of follow-up from baseline:** 12 weeks **Length of follow-up post-intervention:** Immediately **Subgroup analyses:** None **Loss to follow-up:** No loss to follow-up

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O'Connell 2012 *(Continued)*

	Analysis: Adjusted for clustering (multilevel modelling) Sample size calculations performed
Notes	Post-intervention data were extracted following the first phase of the trial (Time 2) prior to cross-over. As an estimate was not reported for the Time 2 follow-up that adjusted for clustering, we used post-intervention data and calculated an effective sample size using ICC of 0.014 to enable inclusion in meta-analysis. Sensitivity analysis - primary outcome: Fruit or vegetable only outcome reported

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Randomly allocated to experimental group but the random sequence generation procedure is not described
Allocation concealment (selection bias)	Unclear risk	There is no information provided about allocation concealment and therefore it is unclear if allocation was concealed
Blinding of participants and personnel (performance bias) All outcomes	Low risk	Vegetable consumption: Objective measure of child's vegetable intake and unlikely to be influenced by performance bias
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Vegetable consumption: Objective measure of child's vegetable intake and unlikely to influence detection bias
Incomplete outcome data (attrition bias) All outcomes	Low risk	There is no reported attrition. Data from 96 children were analysed, very low risk of attrition bias
Selective reporting (reporting bias)	Unclear risk	There is no study protocol therefore it is unclear if there was selective outcome reporting
Other bias	High risk	Baseline imbalances were reported. There were differences in vegetable consumption at baseline, did not adjust for.

Owen 2018

Methods	**Study design:** Randomised controlled trial **Funding:** *"This research was funded by an award to the last author by the Economic and Social Research Council (Award Ref: RES-000-22-3891"*
Participants	**Description:** Children aged 18-24 months and their parent **N (Randomised):**

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Owen 2018 *(Continued)*

127 children

Age:

Child (mean): fruit book = 21.8 months, vegetable book = 21.7 months, control = 21.3 months

% Female:

Child: fruit book = 48%, vegetable book = 50%, control = 56%

SES and ethnicity:

Parent education (% degree): fruit book = 60%, vegetable book = 48%, control = 59%

Household income (% GBP 50k + pa): fruit book = 55%, vegetable book = 50%, control = 42%

Inclusion/exclusion criteria:

Not reported

Recruitment:

"recruited from the University's Child Development Group's database of parents who had expressed an interest in participating in research with their child (n=103), or via adverts placed on the parenting websites Mumsnet and BabyCentre (n=13), flyers placed in local nurseries (n=7) or word of mouth (n=4)."

Recruitment rate:

Unknown

Region:

UK

Interventions

Number of experimental conditions: 3

Number of participants (analysed):

Fruit book = 21, vegetable book = 27, control = 29

Description of intervention:

Visual familiarisation phase: *"parents of children in the 'fruit book' and 'vegetable book' groups were sent a picture book about their child's target fruit or vegetable, respectively. Each book contained 6 pages of color photographs and basic information about the food, presented as a 'farm to fork' story showing how the food grows, how it is sold in shops, and what it looks like when it is cut open, prepared and served Parents were asked to look at the book with their child for 5min every day for 14 consecutive days."*

Taste-exposure phase: *"families in all conditions participated in two weeks of taste exposure. Parents were asked to offer their child a taste of both target foods every day for 15 consecutive days."*

Duration:

4 weeks

Number of contacts:

~29 exposures (visual familiarisation 5min/day for 14 days + taste-exposure for 15 consecutive days)

Setting:

Home

Modality:

Multiple (face-to-face, story book)

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Owen 2018 *(Continued)*

	Interventionist: Parent **Integrity:** *"On each day of taste exposure, parents were asked to record in a daily diary whether they had been able to offer their child a taste of each food and, if so, whether the child had tasted it."* *"During the taste-exposure phase, parents provided a mean of 13.0 (SD=1.97) exposures to the target fruit and 12.3 (SD=2.32) exposures to the target vegetable, indicating a high level of adherence to instructions."* **Date of study:** Unknown **Description of control:** *"Families in the control group did not receive a book and were told that they would be contacted two weeks later"* and took part in the taste-exposure phase.
Outcomes	**Outcome relating to children's fruit and vegetable consumption:** Child's consumption of fruits and vegetables assessed using the Child Food Frequency Questionnaire (CFFQ) completed by parents **Outcome relating to absolute costs/cost-effectiveness of interventions:** Not reported **Outcome relating to reported adverse events:** Not reported **Length of follow-up from baseline:** 4 weeks and 4 months **Length of follow-up post-intervention:** Immediate and 3 months **Subgroup analyses:** None **Loss to follow-up (at immediate and 3 months)** Fruit book: 19%, 50% Vegetable book: 22%, 41% Control: 10%, 26% **Analysis:** Unknown if sample size calculation performed
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement

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Owen 2018 *(Continued)*

Random sequence generation (selection bias)	Unclear risk	The random sequence generation procedure is not described.
Allocation concealment (selection bias)	Unclear risk	There is no information provided about allocation concealment and therefore it is unclear if allocation was concealed.
Blinding of participants and personnel (performance bias) All outcomes	High risk	There is no indication whether participants were blind to group allocation and so judged to be at high risk of performance bias.
Blinding of outcome assessment (detection bias) All outcomes	High risk	There is no mention that participants were blinded to group allocation and therefore the risk of detection bias for this parent self-reported measure is high.
Incomplete outcome data (attrition bias) All outcomes	High risk	78/127 (61%) parents returned the follow-up survey 3 months later, no ITT reported and so risk of attrition bias is high.
Selective reporting (reporting bias)	Unclear risk	There is no study protocol therefore it is unclear if there was selective outcome reporting.
Other bias	Low risk	Delivered at home, risk of contamination bias low

Remington 2012

Methods	**Study design:** Randomised controlled trial **Funding:** *"Supported by Medical Research Council/National Preventive Research Initiative grant G0701864"*
Participants	**Description:** Children aged 3 to 4 years attending nursery school and their primary caregiver **N (Randomised):** 173 parent-child dyads **Age:** Child (mean): tangible reward = 3.96 years, social reward = 3.99 years, control = 3.90 years Primary caregiver (mean): tangible reward = 37.44 years, social reward = 37.35 years, control = 37.52 years **% Female:** Child: tangible reward = 48%, social reward = 54%, control = 55% Primary caregiver (mother): tangible reward = 85%, social reward = 88%, control = 77% **SES and ethnicity:** Primary caregiver: Ethnicity: White = 66%, Black = 2.9%, South Asian = 6%

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Remington 2012 *(Continued)*

Education level: Nongraduate = 24%, Degree level of higher = 62%

Inclusion/exclusion criteria:

Not specified

Recruitment:

"Children aged 3–4 years and their primary caregivers were recruited through nursery schools in North London, United Kingdom.**"**

"Recruitment was done in 3 waves in 2010. At each wave, teachers distributed consent forms and information letters about the "Tiny Tastes" study, and families were asked to return their contact details in a prepaid envelope if they were interested in taking part. Potential participants were then contacted by telephone."

Recruitment rate:

Parent-child dyads: 82% (173/212)

Region:

North London (UK)

Interventions

Number of experimental conditions: 3

Number of participants (analysed):

Taste exposure + tangible reward = 47

Taste exposure + social reward = 46

No treatment control = 47

Description of intervention:

Taste exposure + tangible reward: "The parents were asked to offer their child a small piece (~2.5g) of their target vegetable every day for 12 weekdays and to tell them that they could choose a sticker if they tried it. No tastings were done over the weekends."

Taste exposure + social reward: "Parents were asked to offer the vegetable as described above and to praise their child with phrases such as "brilliant, you're a great vegetable taster" if they tasted it. The parents were to emphasize that the praise was being given for tasting the vegetable"

Duration:

3 weeks

Number of contacts:

12 taste exposures

Setting:

Home

Modality:

Face-to-face

Interventionist:

Primary caregiver

Integrity:

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Remington 2012 *(Continued)*

	"The parents were also given a diary to record whether each day's trial was performed, whether the child tried the vegetable, and whether the reward was given; space was allowed for comment." "No differences in the number of days that the child was offered or tried the target vegetable were found between the intervention groups" **Date of study:** 2010 **Description of control:** "Families assigned to the control group did not perform any daily tastings and were given no instructions or materials for the intervention period, but were told that they would be taught a special technique to help their child to eat more vegetables after the last visit."
Outcomes	**Outcome relating to children's fruit and vegetable consumption:** Child's consumption of target vegetable (grams). "Intake (in g) was recorded by weighing the bowl containing pieces of the target vegetable before and after consumption with a digital scale (Mettler Toledo)." **Outcome relating to absolute costs/cost effectiveness of interventions:** Not reported **Outcome relating to reported adverse events:** Not reported **Length of follow-up from baseline:** 3 weeks, ~ 2 months and ~ 4 months **Length of follow-up post-intervention:** Immediately and at 1 and 3 months **Subgroup analyses:** None **Loss to follow-up (Immediately post-intervention, and at 1 and 3 months):** Taste exposure + tangible reward = 0%, 0%, 3% Taste exposure + social reward = 0%, 3%, 2% No treatment control = 0%, 5%, 2% **Analysis:** Sample size calculations performed.
Notes	Data from the longest follow-up < 12 months (3 month follow-up) were extracted for inclusion in meta-analysis. Estimates were reported comparing the tangible reward and control conditions, but not social reward condition. We estimated mean and SEM from a study figure using an online resource (Plot Digitizer: plotdigitizer.sourceforge.net) for all 3 groups. The tangible reward and social reward conditions were combined into a single intervention group for inclusion in meta-analysis. Sensitivity analysis - primary outcome: Fruit or vegetable intake is primary outcome as per trial registry.
Risk of bias	

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Remington 2012 *(Continued)*

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Randomly allocated to experimental group but the random sequence generation procedure is not described
Allocation concealment (selection bias)	Low risk	There is no information provided about allocation concealment and therefore it is unclear if allocation was concealed
Blinding of participants and personnel (performance bias) All outcomes	Low risk	Consumption of target vegetable: There is insufficient information to determine the likelihood of performance bias
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Consumption of target vegetable: There is insufficient information to determine the likelihood of detection bias
Incomplete outcome data (attrition bias) All outcomes	Low risk	The proportion that completed the follow-up assessments is not reported and therefore the risk of attrition bias is unclear
Selective reporting (reporting bias)	Unclear risk	The primary outcomes reported align with those specified in the trial registration. However the secondary outcomes specified on trial registry do not appear to be reported in the abstract
Other bias	Low risk	Contamination bias that could threaten the internal validity is unlikely to be an issue

Remy 2013

Methods	**Study design:** Randomised controlled trial **Funding:** Not reported
Participants	**Description:** Children aged 4 to 8 months old and their parent **N (Randomised):** 100 parent-child dyads **Age:** Mean: Repeated exposure = 6.3 months, Flavour-flavour learning = 6.6 months, Flavour-nutrient learning = 6.2 months Parent: not specified **% Female:** Child: Repeated exposure = 47%, Flavour-flavour learning = 35%, Flavour-nutrient learning = 38% Parent: mostly mothers (exact % not reported)

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Remy 2013 *(Continued)*

SES and ethnicity:

Not specified

Inclusion/exclusion criteria:

"The criteria for children inclusion were as follows: age between 4 and 8 mo, introduction of complementary foods was started at >2 wk and <2 mo before the start of the study, no health problems or food allergies at the beginning of the study, and gestational age ≥36 wk."

Recruitment:

"Parents in the Dijon area of France were recruited using leaflets or posters distributed in health professionals consulting rooms, pharmacies, and day-care centers."

Recruitment rate:

Parent-child dyads = 81% (100/123)

Region:

Dijon (France)

Interventions

Number of experimental conditions: 3

Number of participants (analysed):

Repeated exposure = 32

Flavour-flavour learning = 30

Flavour-nutrient learning = 30

Description of intervention:

"During the exposure period, infants were exposed 10 times to a basic (RE group), a sweet (FFL group), or an energy-dense (FNL group) artichoke puree according to their group."

Duration:

Approx. 41 days

Number of contacts:

2 - 3 times per week

Setting:

Home

Modality:

Face-to-face

Interventionist:

Parents

Integrity:

"parents were given precise instructions, and data collected in the notebook revealed that they complied with the instructions."

Date of study:

October 2010 and May 2011

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Remy 2013 *(Continued)*

	Description of control: N/A
Outcomes	**Outcome relating to children's fruit and vegetable consumption:** Child's consumption of varied artichoke purees (grams). "To measure intake, parents were asked to weigh each jar before and after consumption, using a digital kitchen scale (61 g, Soehnle) that we provided them with, and to record the weight in a notebook. After each observation, parents were required to reseal the jar(s) of food, freeze them, and bring the used jars back to the laboratory to check compliance with the study procedure and data accuracy." **Outcome relating to absolute costs/cost effectiveness of interventions:** Not reported **Outcome relating to reported adverse events:** Not reported **Length of follow-up from baseline:** Unclear **Length of follow-up post-intervention:** 2 weeks, 3 months and 6 months **Subgroup analyses:** None **Loss to follow-up (at 2 weeks, 3 and 6 months):** Overall = 5%, 7%, 8% **Analysis:** Sample size calculations performed.
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Randomly allocated to experimental group but the random sequence generation procedure is not described
Allocation concealment (selection bias)	Unclear risk	There is no information provided about allocation concealment and therefore it is unclear if allocation was concealed
Blinding of participants and personnel (performance bias) All outcomes	Low risk	Vegetable intake: The interventions are all artichoke puree with different nutrient content. Parents would be unable to determine study group from feeding the child, and therefore this would be unlikely to influence the outcome
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Vegetable intake: This is objective assessment. Parents would be unable to determine study group from feeding the child, and therefore this would be unlikely to influence the outcome

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Remy 2013 *(Continued)*

Incomplete outcome data (attrition bias) All outcomes	High risk	5 families dropped out during the exposure period and were excluded. An intention-to-treat approach was not used and therefore at high risk of attrition bias
Selective reporting (reporting bias)	Low risk	The outcomes reported in the paper align with those specified in the trial registration
Other bias	Low risk	Contamination bias that could threaten the internal validity is unlikely to be an issue

Roe 2013

Methods	**Study design:** Cluster-randomised controlled trial – cross-over **Funding:** *"Supported by NIH grant R01 DK082580"*
Participants	**Description:** Children 3 to 5 years attending the Bennett Family Center on campus at The Pennsylvania State University **Age:** Mean: 4.4 years **% Female:** 52% **SES and ethnicity:** "The children were racially diverse: 56% were white, 29% Asian, 11% black or African American, and 4% Pacific Islander." **Inclusion/exclusion criteria:** No explicit inclusion criteria stated for this trial Exclusion criteria: "Children who were allergic to any of the foods to be served at the snack were not included in the study." **Recruitment:** "Participants in the study were recruited by distributing letters to parents of children in 4 classrooms of the childcare facility that included children aged 3–5 y; these classrooms had a total of ˜75 children present at snack time." **Recruitment rate:** Unknown **Region:** Pennsylvania (USA)
Interventions	**Number of experimental conditions:** 8

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Roe 2013 *(Continued)*

Number of participants (analysed):

Overall = 61

Description of intervention:

Variety type serve:

1 x occasion: a variety of all 3 vegetables offered (cucumber, sweet pepper, tomato)

1 x occasion: a variety of all 3 fruits offered (apple, peach, pineapple)

Single-type serve:

3 x occasions: a single type of vegetable offered (cucumber, sweet pepper, tomato)

3 x occasions: a single type of fruit offered (apple, peach, pineapple)

Duration:

4 weeks

Number of contacts:

8

Setting:

Preschool

Modality:

Face-to-face

Interventionist:

Childcare helper

Integrity:

No information provided

Date of study:

February to April 2011

Description of control:

N/A

Outcomes	**Outcome relating to children's fruit and vegetable consumption:** Child's consumption of fruit and vegetables (number of pieces). "The number of pieces of vegetables or fruit selected by each child in the study was recorded independently by 2 observers seated near each table." "After the meal, the number of uneaten pieces on each child's plate was recorded as well as any dropped pieces. All uneaten food and beverage items were weighed after the meal with digital scales (models PR5001 and XS4001S; Mettler-Toledo Inc)." **Outcome relating to absolute costs/cost effectiveness of interventions:** Not reported **Outcome relating to reported adverse events:** Not reported

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Roe 2013 *(Continued)*

Length of follow-up from baseline:

Unclear

Length of follow-up post-intervention:

Immediately

Subgroup analyses:

None

Loss to follow-up:

No loss to follow-up

Analysis:

Unclear if adjusted for clustering

Unclear if sample size calculations performed

Notes

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Random sequence created using a computerised random-number generator.
Allocation concealment (selection bias)	Unclear risk	There is no information provided about allocation concealment and therefore it is unclear if allocation was concealed
Blinding of participants and personnel (performance bias) All outcomes	Low risk	Vegetable and fruit intake Child's vegetable and fruit intake unlikely to be influenced by performance bias
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Vegetable and fruit intake: 2 observers independently recorded the number of pieces of vegetables or fruit selected by each child. However it is unclear whether these observers were blinded to condition and whether this influenced detection bias. This was observation of the number of pieces of fruit or veg selected and eaten by each child, and weight of any uneaten pieces of fruit/veg on the plate at end of meal. It was assessed by 2 independent observers, but it is not clear if they were blinded or not. Childcare staff sat at table with children and passed around fruit & veg bowls but were unaware of the study hypotheses
Incomplete outcome data (attrition bias) All outcomes	Low risk	54 (89%) of the 61 children completed the liking ratings and therefore the risk of attrition bias is low
Selective reporting (reporting bias)	Low risk	The primary outcomes reported in the paper align with those specified in the trial registration
Other bias	Low risk	Contamination, baseline imbalance, & other bias that could threaten the internal validity are unlikely to be an issue

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Roset-Salla 2016

Methods	**Study design:** Cluster-randomised controlled trial **Funding:** *"This work was supported by a grant for investigation in nursing from Collegi Oficial d' Infermeria de Barcelona, 2009 (grant number PR-5001/09); Primer Premio Nacional de Investigación en Enfermería, 2009, from Hospital Universitario Marqués de Valdecilla; and a grant for investigation in nursing from Acadèmia de Ciències Mèdiques de Catalunya i Balears, filial Maresme, 2010. The funders had no role in the design, analysis or writing of this article."*
Participants	**Description:** Children aged 1 to 2 years attending 12 daycare centres and their parent **N (Randomised):** 12 day-care centres, 206 children, 195 parents **Age:** Child (mean): Intervention = 1.3 years, Control = 1.4 years Parent (mean): Intervention = 35 years, Control = 35 years **% Female:** Child: Intervention = 37%, Control = 49% Parent: Intervention = 93%, Control = 85% **SES and ethnicity:** Educational level: Primary = 10%, Secondary = 35%, University = 55% **Inclusion/exclusion criteria:** No explicit inclusion criteria stated for this trial Exclusion criteria: "Children still exclusively breast-feeding at the time of the study, children whose parents were not responsible for their alimentation, children with special diets due to chronic diseases (such as coeliac disease, food intolerances or allergies, inflammatory bowel disease), parents with language difficulties, parents unable to attend the educational workshops and those who did not sign the informed consent." **Recruitment:** "At the beginning of the school term, all parents of the children attending the participating day-care centres were invited to informative meetings regarding the study with the use of pamphlets and posters." **Recruitment rate:** Child: 35% (206/581) **Region:** The city of Mataró (north of Barcelona), Spain
Interventions	**Number of experimental conditions:** 2 **Number of participants (analysed):**

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Roset-Salla 2016 *(Continued)*

Child: Intervention = 75, Control = 67

Parent: Intervention = 74, Control 72

Description of intervention:

"All parents from the day-care centres in the intervention group (IG) were invited to attend four educational workshops on alimentation at the beginning of the study and one reminder at 4 months. A model of participatory-active education was used, in order to achieve practical skills in addition to nutritional knowledge. Cognitive (teaching how to improve diet), emotional (addressing beliefs and attitudes of the participants through discussion and analysis techniques) and skill areas (developing dietary skills) were included. The aim was to incorporate new and better dietary knowledge and to change the habits of the participants."

Duration:

6 months (workshops in October - November and a reminder in March)

Number of contacts:

5 workshops

Setting:

Preschool

Modality:

Face-to-face

Interventionist:

Nurses trained in nutrition

Integrity:

No information provided

Date of study:

October 2010 to May 2011

Description of control:

"The parents included in the control group (CG) did not receive any education related to nutrition. In order to avoid drop outs, the participants of the CG were invited to a workshop on a subject not related to the study or nutritional education (manipulation and conservation."

Outcomes

Outcome relating to children's fruit and vegetable consumption:

Child's consumption of fruits and vegetables (servings per day) assessed using a 78-item food frequency questionnaire (FFQ) completed by parents

Outcome relating to absolute costs/cost effectiveness of interventions:

Not reported

Outcome relating to reported adverse events:

Not reported

Length of follow-up from baseline:

8 months

Length of follow-up post-intervention:

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Roset-Salla 2016 *(Continued)*

	2 months **Subgroup analyses:** None **Loss to follow-up:** Child: Intervention = 32%, Control = 35% Parent: Intervention = 9%, Control = 8% **Analysis:** Did not adjust for clustering. Unknown if sample size calculation performed.
Notes	First reported outcome (changes in vegetable and garden produce servings per day) was extracted for inclusion in the meta-analysis. To enable inclusion in meta-analysis, we calculated post-intervention means by group by summing baseline and change from baseline means, assuming baseline SDs for post-intervention SDs, and we calculated an effective sample size using ICC of 0.014 to account for clustering Sensitivity analysis - primary outcome: Primary outcome not stated, fruit or vegetable intake 2nd listed outcome after adherence to Mediterranean diet

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Randomly allocated to experimental group but the random sequence generation procedure is not described
Allocation concealment (selection bias)	Unclear risk	There is no information provided about allocation concealment and therefore it is unclear if allocation was concealed
Blinding of participants and personnel (performance bias) All outcomes	High risk	Dietary intake (self-reported): There is no blinding to group allocation of participants and this is likely to influence performance
Blinding of outcome assessment (detection bias) All outcomes	High risk	Dietary intake (self-reported): There is no blinding to group allocation of participants and because this is a self-reported measure this is likely to introduce detection bias
Incomplete outcome data (attrition bias) All outcomes	High risk	“Of the parents randomized to the IG only sixty-seven (65 %) attended three or more workshops, with the remaining parents considered drop outs. The reasons for not attending the workshops were mainly difficulties in family timetables and illness of the children”. 35% of the intervention group did not attend the minimum of 3 workshops and were considered dropouts. Therefore analysis was not undertaken according to intention-to-treat principles and risk of attrition bias is high
Selective reporting (reporting bias)	Unclear risk	There is no study protocol therefore it is unclear if there was selective outcome reporting

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Roset-Salla 2016 *(Continued)*

Other bias	Unclear risk	There were baseline imbalances for certain characteristics between the conditions (e.g. servings of legumes), although adjusted for in the analysis and so the impact of this is unclear. Analysis did not accounted for effect of clustering, but we calculated an effective sample size prior to pooling in meta-analysis to account for this

Savage 2012

Methods	**Study design:** Randomised controlled trial **Funding:** Not reported
Participants	**Description:** Children aged 3 to 5 years attending full-day childcare at the Child Development Laboratory located at The Pennsylvania State University **N (Randomised):** 21 children **Age:** Mean = 4.3 years **% Female:** 59% **SES and ethnicity:** “most of the families (60%) reported combined family incomes of US>$50,000.” **Inclusion/exclusion criteria:** “Exclusion criteria were the presence of food intolerance to study foods, chronic illness affecting food intake, consuming <22 g of the entree (<10% of the 220-g entree portion), dislike of the main entree, uncooperative behavior during lunch, non-English speaking, or extended absences.” **Recruitment:** Not specified **Recruitment rate:** Unknown **Region:** Pennsylvania (USA)
Interventions	**Number of experimental conditions:** 6 **Number of participants (analysed):** Overall = 17 (not specified by group) **Description of intervention:**

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Savage 2012 *(Continued)*

"Children were served a series of 6 lunches in a random order, once per week, which varied only in entrée portion size (entree portion size order: 100, 160, 220, 280, 320, and 400 g). Children were served lunch on the same day of the week at their regularly scheduled time in an eating laboratory dining room facility near their classroom."

"The menu at all lunches included the portion-manipulated macaroni and cheese entree and fixed portions of 2% milk and other foods served with the entree (eg, green beans with butter, whole-wheat roll, and unsweetened applesauce)."

Duration:

6 days

Number of contacts:

6 (1 lunch per day)

Setting:

Preschool

Modality:

Face-to-face

Interventionist:

Research staff

Integrity:

No information provided

Date of study:

2007

Description of control:

N/A

Outcomes

Outcome relating to children's fruit and vegetable consumption:

Child's consumption of fruit and vegetable for different entree portion sizes (grams). "Food and milk weights were recorded before and after consumption to the nearest 0.1 g by using digital scales (Mettler-Toledo PR5001 and Mettler-Toledo XS4001S; Mettler-Toledo Inc). The amount of each food item consumed (g) was determined by subtracting postmeal weights from premeal weights."

Outcome relating to absolute costs/cost effectiveness of interventions:

Not reported

Outcome relating to reported adverse events:

Not reported

Length of follow-up from baseline:

6 days

Length of follow-up post-intervention:

Immediately

Subgroup analyses:

None

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Savage 2012 *(Continued)*

	Loss to follow-up: Overall = 19% (not specified by group) **Analysis:** Unknown if sample size calculations performed.
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Randomly allocated but the random sequence generation procedure is not described
Allocation concealment (selection bias)	Unclear risk	There is no information provided about allocation concealment and therefore it is unclear if allocation was concealed
Blinding of participants and personnel (performance bias) All outcomes	Low risk	Food and milk intake: Objective measure of child's food intake and unlikely to be influenced by performance bias
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Food and milk intake (weighed before and after consumption): Objective measure of child's food intake because food was weighed before and after consumption. Low risk of detection bias
Incomplete outcome data (attrition bias) All outcomes	Low risk	There is no reported attrition. Data are reported for all of the 17 children who met predetermined inclusion criteria, very low risk of bias
Selective reporting (reporting bias)	Unclear risk	There is no study protocol therefore it is unclear if there was selective outcome reporting
Other bias	Low risk	Contamination bias that could threaten the internal validity is unlikely to be an issue

Segura-Perez 2017

Methods	**Study design:** Randomised controlled trial **Funding:** *"USDA Food and Nutrition Service via Cornell University"*
Participants	**Description:** Children < 5 years of age and their low-income parent attending a SNAP-Ed education session in Hartford, USA **N (Randomised):** 193 parent-child dyads

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Segura-Perez 2017 *(Continued)*

Age:

Child: < 5 years of age

Parent (mean): overall = 32 years

% Female:

Child: not reported

Parent: overall = 96%

SES and ethnicity:

Low income, 80% receiving 'SNAP benefits'

"79% were Hispanic"

Inclusion/exclusion criteria:

Inclusion criteria: *"SNAP eligible participants with children under 5 years old living at home, Living in Hartford, CT, Having a cell phone with unlimited smart phone data plans."*

Exclusion criteria: *"Not living in Hartford, Less than 18 years old."*

Recruitment:

"Participants were recruited and screened for eligibility at WIC offices and other community settings"

Recruitment rate:

83% (240/290)

Region:

Hartford (USA)

Interventions

Number of experimental conditions: 2

Number of participants (analysed):

Overall = 169 (not specified by group)

Description of intervention:

"four $5 coupons for use at the MM [mobile market] during the next 6 weeks plus a month of daily text messages informing them about MM stop locations, tips on preparing/eating more fruit and vegetables, and reminders to use their coupons."

Duration:

4 weeks

Number of contacts:

Daily contacts for 1 month

Setting:

Community

Modality:

Text messaging

Interventionist:

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Segura-Perez 2017 *(Continued)*

	Not specified, assume researcher sends text messages **Integrity:** No information provided **Date of study:** October 2015-September 2016 **Description of control:** *"received text messages about free family community events."*
Outcomes	**Outcome relating to children's fruit and vegetable consumption:** Child's consumption of fruits and vegetables *"measured with one question [for fruit / vegetable] about daily consumption of fruits from a seven item fruit and vegetable checklist developed by Townsend et.al."* completed as part of a telephone interview with parents **Outcome relating to absolute costs/cost-effectiveness of interventions:** Not reported **Outcome relating to reported adverse events:** Not reported **Length of follow-up from baseline:** 6 weeks **Length of follow-up post-intervention:** 2 weeks **Subgroup analyses:** None **Loss to follow-up (at 2 weeks)** Overall = 12% (not specified by group) **Analysis:** Unknown if sample size calculation performed
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	The random sequence generation procedure is not described.
Allocation concealment (selection bias)	Unclear risk	There is no information provided about allocation concealment and therefore it is unclear if allocation was concealed.
Blinding of participants and personnel (performance bias) All outcomes	High risk	There is no indication whether participants were blind to group allocation and so judged to be at high risk of performance bias.

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Segura-Perez 2017 *(Continued)*

Blinding of outcome assessment (detection bias) All outcomes	High risk	There is no mention that participants were blinded to group allocation and therefore the risk of detection bias for this self-reported measure is high.
Incomplete outcome data (attrition bias) All outcomes	Low risk	169/193 (88%) completed the 6-week follow-up assessment, no ITT reported and so the risk of attrition bias is low.
Selective reporting (reporting bias)	High risk	Vegetable consumption (a primary outcome in the trial registration) is not reported in the published abstracts.
Other bias	Low risk	Delivered via text messages, low risk of contamination bias

Sherwood 2015

Methods	**Study design:** Randomised controlled trial **Funding:** *"The project described was supported by grant numbers A1R21DK078239 (principal investigator [PI]: Sherwood), P30DK050456 (PI: Levine), and P30DK092924 (PI: Schmittdiel) from the National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK)."*
Participants	**Description:** Parents with children aged 2-4 years **N (Randomised):** 60 parent-child dyads **Age:** Children (mean): Busy Bodies/Better Bites = 2.60 years, Healthy Tots/Safe Spots: 2.90 years Parent (mean): Bodies/Better Bites = 34.4 years, Healthy Totes/Safe Spots = 33.4 years **% Female:** Children: Busy Bodies/Better Bites = 50%, Healthy Totes/Safe Spots = 40% Parents: Busy Bodies/Better Bites = 97%, Healthy Totes/Safe Spots = 90% **SES and ethnicity:** Busy Bodies/Better Bites: white = 77%, Hispanic = 7%, Healthy Totes/Safe Spots: white = 83%, Hispanic = 7% **Inclusion/exclusion criteria:** Inclusion criteria: BMI between 85th and 95th percentile for age and gender OR BMI between 50th and 85th percentile and at least 1 overweight parent (BMI ≥ 25kg/m^2) and receives care at a HealthPartners Clinic in the Twin Cities Metropolitan Area. Exclusion criteria: children with chronic disease, children who within the last 6 months or currently taking Prednisone, Prednisolone, Decadron, families who have limited English skills, and families who plan to move out of the Metropolitan area within the next 6 months **Recruitment:**

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Sherwood 2015 *(Continued)*

	"Parent-child dyads were recruited through 20 clinics in the greater Minneapolis–St. Paul area"
	"…a study invitation letter was sent to parents. A subsequent phone call assessed interest and preliminary eligibility, confirmed in a home visit."
	Recruitment rate:
	94% (60/64)
	Region:
	USA
Interventions	**Number of experimental conditions:** 2
	Number of participants (analysed):
	Busy Bodies/Better Bites: 30
	Healthy Totes/Safe Spots: 30
	Description of intervention:
	All participants received pediatric primary care provider counselling during their well-child visit to raise parental awareness of their child's obesity risk and provide messaging regarding obesity and injury prevention behaviours.
	Busy Bodies/Better Bites: participants received an 8-session phone-coaching programme focused on healthy eating and PA and an associated workbook and busy bag, which included "a child focused book on television (TV) habits, activity and dinner table conversation idea cards, portion placement and plate, a kid-friendly, healthy recipe pamphlet, small plastic cones, sidewalk chalk, stickers, a child-focused dance music CD, and an inflatable beach ball."
	Healthy Totes/Safe Spots: participants received an 8-session phone-coaching programme focused on safety and injury prevention and an associated workbook and safety tote, which included "a similar number of items [to the busy bag] relevant to the safety and injury prevention topics (e.g., travel-size sunscreen or fire safety book)."
	Duration:
	6 months
	Number of contacts:
	9 (1 primary care component + 8 phone coaching sessions)
	Setting:
	Clinic + home
	Modality:
	Multiple (face-to-face, telephone, written materials)
	Interventionist:
	PCP (face-to-face) and experienced interventionists (telephone)
	Integrity:
	Provider adherence: "Well-child visit protocol adherence was assessed by phone survey with parents 1–2 weeks post-well-child visit. Parents reported whether their provider talked about BMI percentile, whether they received the HHHK pamphlet, and whether the provider addressed specific PA, sedentary behavior, healthy eating, and safety/injury prevention issues."

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Sherwood 2015 *(Continued)*

	Phone coaches: "Phone coaches completed a self-assessment of session fidelity (e.g., use of behavioral adherence strategies and time spent discussing specific target areas) after each session. Phone sessions were audio recorded, and recordings were utilized during supervision sessions and subsequently coded by independent raters to provide a more in-depth examination of fidelity." Well-child visit intervention component: "Parents reported that 78% of providers discussed BMI percentile. The majority of parents (87%) received the HHHK pamphlet, but less than half (44%) reported that their provider used the HHHK flipchart. The most frequently discussed obesity prevention topics included fruit and vegetable intake (27%), PA (24%), junk food, including sweetened beverages (11%), and media use (7%). Fewer parents reported that the provider discussed family meals (5%), eating breakfast (4%), and eating out at restaurants (0%)." "80% of participants in both arms completed the eight-session intervention." **Date of study:** Unknown **Description of control:** N/A
Outcomes	**Outcome relating to children's fruit and vegetable consumption:** Consumption of fruits and vegetables (servings) using a multipass 24-hour recall completed by parents. **Outcome relating to absolute costs/cost-effectiveness of interventions:** Not reported **Outcome relating to reported adverse events:** Not reported **Length of follow-up from baseline:** 6 months **Length of follow-up post-intervention:** Immediately **Subgroup analyses:** None **Loss to follow-up:** Busy Bodies/Better Bites: 13% Healthy Totes/Safe Spots: 3% **Analysis:** Unknown if sample size calculation was performed.
Notes	Sensitivity analysis - primary outcome: primary outcome as per trial registry included fruit and vegetable intake

Risk of bias

Bias	Authors' judgement	Support for judgement

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Sherwood 2015 *(Continued)*

Random sequence generation (selection bias)	Unclear risk	"Sixty parent-child dyads were randomized equally to the Busy Bodies/Better Bites Obesity Prevention and the Healthy Tots/Safe Spots Contact control arms." It is unclear how the randomisation occurred
Allocation concealment (selection bias)	Unclear risk	There is no information provided about allocation concealment and therefore it is unclear if allocation was concealed from those conducting the research.
Blinding of participants and personnel (performance bias) All outcomes	High risk	"After the well-child visit, parents received a randomized group assignment notification letter…" "Coaches worked with parents to address behavior change areas in order of parent preference, setting goals and discussing challenges and successes at subsequent sessions." Participants were aware of their group allocation. Due to the nature of the intervention, staff would also have been aware of participant group allocation.
Blinding of outcome assessment (detection bias) All outcomes	High risk	"A multipass 24-hour dietary recall was administered by staff trained and certified to use the Nutrition Data System for Research software versions 2009, 2010, and 2011" It is unclear whether outcome assessors visiting the home were aware of group allocation. Parents self-reported child dietary intake.
Incomplete outcome data (attrition bias) All outcomes	Low risk	The number of parents who completed the follow-up assessments is reported and there was only a small loss to follow-up that was similar across experimental arms.
Selective reporting (reporting bias)	Low risk	All outcomes reported as per protocol, except for "Paediatrician participation and satisfaction at 6 months" This was reported after 3 HHHK visits, not at 6 months.
Other bias	Low risk	No other bias was identified.

Skouteris 2015

Methods	**Study design:** Randomised controlled trial **Funding:** *"Australian Research Council Linkage Grant (ARC LP100100049)"*
Participants	**Description:** Children aged 20 to 42 months and their parent **N (Randomised):** 201 parent-child dyads **Age:** Child (mean): Intervention = 2.7 years, Control = 2.8 years Parent (mean): Intervention = 35 years, Control = 35 years

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Skouteris 2015 *(Continued)*

% Female:

Child: Intervention = 49%, Control = 37%

Parent: not specified

SES and ethnicity:

Parent highest level of education (Bachelor degree or higher): Intervention = 57%, Control = 60%

Annual family income (AUD):

AUD < 450,000: Intervention = 14%, Control = 21%

AUD 45,001 – 85,000: Intervention = 41%, Control = 33%

AUD 85,001 – 125,000: Intervention = 27%, Control = 27%

AUD > 125,000: Intervention = 17%, Control = 19%

Location of parents' birth:

Australia or New Zealand: Intervention = 77%, Control = 74%

Europe: Intervention = 3%, Control = 4%

Asia: Intervention = 11%, Control = 9%

Inclusion/exclusion criteria:

Inclusion criteria: "Families were eligible if their child was aged 20–42 months at baseline (waitlist children would still be ≤ 4 years when receiving the programme), and if parents were aged ≥ 18 years and could read and write English (with the assistance of an interpreter if required). There were no other qualifying or exclusion criteria."

Recruitment:

"We sourced participants through community events, local newspaper and magazine advertisements, flyers distributed through kindergartens/pre-schools/childcares, maternal and child health centres, and medical centres."

Recruitment rate:

Parent-child dyads = 97% (201/207)

Region:

Victoria (Australia)

Interventions

Number of experimental conditions: 2

Number of participants (analysed):

Time 2: Intervention = 80, Control = 72

Time 3: Intervention = 74, Control = 69

Time 4: Intervention = 73, Control = 63

Description of intervention:

MEND (Mind, Exercise, Nutrition…Do it! 2 – 4 intervention: "Each session included three sections: (i) 30 min of guided active play; (ii) 15 min of healthy snack time based on an evidence-based, exposure technique to promote acceptance of fruit and vegetables and (iii) 45 min of supervised creative play activities for the children while parents attended an interactive education and skill development session. Guided active play involved games played with children and parents together that could be easily repli-

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Skouteris 2015 *(Continued)*

cated at home. Healthy snack time centred on a role model (puppet called 'Max Moon') who encouraged children to sniff, touch, lick and taste fresh fruit and vegetables. Parents received weekly handouts."

Duration:

10 weeks

Number of contacts:

10 (1 per week, 90 minutes a session)

Setting:

Community health centres

Modality:

Face-to-face

Interventionist:

Trained program leader

Integrity:

"Programme leaders were monitored regularly to ensure their practice was in accordance with guidelines."

Date of study:

Between May 2010 and December 2012

Description of control:

Wait-list control:

"The WLC group did not receive any intervention, but were offered the programme at study completion."

Outcomes	**Outcome relating to children's fruit and vegetable consumption:** Child's consumption of fruit and vegetables (usual servings) assessed by the Eating and Physical Activity Questionnaire completed by parents. **Outcome relating to absolute costs/cost effectiveness of interventions:** Not reported **Outcome relating to reported adverse events:** Not reported **Length of follow-up from baseline:** Post-intervention: 10 weeks Time 2: ~ 8 - 9 months Time 3: ~ 15 months **Length of follow-up post-intervention:** Immediately Time 2: 6 months

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Skouteris 2015 *(Continued)*

	Time 3: 12 months **Subgroup analyses:** None **Loss to follow-up (Immediately post-intervention and at 6 and 12 months):** Intervention = 12%, 4%, 4% Control = 5%, 6%, 6% **Analysis:** Sample size calculations performed
Notes	First reported outcome (usual servings a day of vegetables) at the longest follow-up < 12 months (6 months) and ≥ 12 months (12 months) was extracted for inclusion in meta-analysis Sensitivity analysis - primary outcome: Fruit or vegetable intake listed as primary outcome in trial registry.

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	”conducted by a researcher not involved in data management using a randomized treatment allocation schedule produced by computer algorithm.” The random sequence was produced by computer algorithm
Allocation concealment (selection bias)	Unclear risk	Although the authors indicate that participants were informed of group allocation by opaque envelopes, there is no indication if these envelopes were sealed and sequentially numbered
Blinding of participants and personnel (performance bias) All outcomes	High risk	Dietary intake (includes fruit and vegetables): There is no blinding to group allocation of participants described and this is likely to influence performance
Blinding of outcome assessment (detection bias) All outcomes	High risk	Dietary intake (includes fruit and vegetables) (self-report): There is no blinding to group allocation of participants described and because of the self-report measure this is likely to influence detection bias
Incomplete outcome data (attrition bias) All outcomes	Low risk	Attrition rate was < 20% at follow-up T4 and missing values of baseline measurements were imputed using mean imputation
Selective reporting (reporting bias)	Unclear risk	“Outcomes not addressed here will be presented in future papers.” Insufficient evidence to determine, as it appears that future papers with additional outcomes are planned
Other bias	Low risk	Contamination bias that could threaten the internal validity is unlikely to be an issue

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Smith 2017

Methods	**Study design:** Cluster-randomised controlled trial **Funding:** Not reported
Participants	**Description:** Low socio-economic children aged 3-5 years attending Head Start preschools in Marion County, Ohio **N (Randomised):** 4 Head Start centres, 240 children **Age:** "All clusters combined had a total of 80 (38.3%) three year old children, 116 (55.5%) four year old children, and 13 (6.2%) five year old children in the study sample." **% Female:** Access-only cluster = 54%, access + education = 45%, control = 55% **SES and ethnicity:** Low socio-economic "There were 9 (4.3%) Hispanic children, 152 (72.7%) white children, 36 (17.2%) multi-racial, and 12 (5.7%) black children in the study sample" **Inclusion/exclusion criteria:** No explicit inclusion criteria Exclusion criteria: "Children or parents were excluded if a medical issue prohibited them from participating in the study. Children who were unable to eat solid foods were asked not to participate in this study. Children with chronic diseases, such as diabetes, were excluded from the study, as children with chronic diseases are known to have reduced carotenoid concentrations" **Recruitment:** "Purposive sampling was the method chosen for this study". Parents were approached about consenting to the study at various meetings or when parents were dropping off or picking up their children. **Recruitment rate:** 83% (240/290) **Region:** Marion County, Ohio
Interventions	**Number of experimental conditions:** 3 **Number of participants (analysed):** Access only: 61 Access + education: 82 Control: 66 **Description of intervention:**

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Smith 2017 *(Continued)*

Access only: "received the take home weekly fruits and vegetables, without the educational intervention."

Access + education: "received weekly take home fruits and vegetables, education for the children, and supplemental materials, such as newsletters and recipes, for the families about the produce being provided."

The Supplemental Nutrition Assistance Program Education (SNAP-Ed) was provided each week. "The Harvest for Healthy Kids curriculum was used and each week the focus was on a high carotenoid fruit or vegetable. Storybooks, activities such as making pumpkin pudding in a bag, and tastings were the foundation of the class sessions."

Duration:

8 weeks

Number of contacts:

8

Setting:

Preschool + home

Modality:

Access only: provision of fruit and vegetable

Access + education: multiple (provision of fruit and vegetable, face-to-face education, written materials)

Interventionist:

Access only: unclear

Access + education: Supplemental Nutrition Assistance Program Education (SNAP-Ed) programme staff member delivered education

Integrity:

No information provided

Date of study:

October-December 2016

Description of control:

"the control group did not receive either the produce or education during the eight weeks."

"The group received education following the study."

Outcomes

Outcome relating to children's fruit and vegetable consumption:

Consumption of fruit and vegetable consumption measured by carotenoid levels in the skin

Outcome relating to absolute costs/cost-effectiveness of interventions:

Not reported

Outcome relating to reported adverse events:

Not reported

Length of follow-up from baseline:

8 weeks

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Smith 2017 *(Continued)*

	Length of follow-up post-intervention: Immediately **Subgroup analyses:** None **Loss to follow-up:** Access only: 18% Access + education: 10% Control: 12% **Analysis:** Unclear if adjusted for clustering Sample size calculations performed
Notes	We pooled the access + education intervention arm compared to the no-intervention control group in meta-analysis of multicomponent interventions. We described the access-only intervention compared to the no-intervention control group narratively.

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	"Site clusters were randomly assigned to one of the treatment or control groups". Randomly allocated to experimental group but the random sequence generation procedure is not described.
Allocation concealment (selection bias)	Unclear risk	There is no information provided about allocation concealment and therefore it is unclear if allocation was concealed.
Blinding of participants and personnel (performance bias) All outcomes	High risk	Participants and study team were not blinded. Parent self-reported survey on fruit and vegetable consumption and therefore at high risk of performance bias.
Blinding of outcome assessment (detection bias) All outcomes	High risk	Parents were not blinded which may have affected how they responded to the survey. Parent self-reported survey on fruit and vegetable consumption and therefore at high risk of detection bias.
Incomplete outcome data (attrition bias) All outcomes	Low risk	There were 31/240 withdrawn (27 from intervention, 4 from control).
Selective reporting (reporting bias)	Unclear risk	No trial protocol is available
Other bias	Unclear risk	There appears to be baseline imbalance between groups with differences between groups on child age and race.

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Smith 2017 *(Continued)*

	Analysis does not appear to account for clustering. The review author adjusted for in the meta-analysis.

Spill 2010

Methods	**Study design:** Cluster-randomised controlled trial – cross-over **Funding:** *"Supported by the National Institute of Diabetes and Digestive and Kidney Diseases (R01 DK082580) and the Robert Wood Johnson Foundation"*
Participants	**Description:** Children aged 3 to 6 years enrolled in daycare at the Bennett Family Center on campus at The Pennsylvania State University **N (Randomised):** 5 classrooms, 51 children **Age:** Mean = 4.4 years **% Female:** 57% **SES and ethnicity:** “Of the 51 children in the study, 46 parents provided demographic information for their children. Of these 46 children, 28 (61%) were white, 14 (30%) were Asian, 3 (7%) were black or African American, and 1 (2%) was American Indian or Alaska Native. Parents of the children had above-average educational levels and household incomes; 90% of mothers and 85% of fathers had a college degree, and 79% of households had an annual income >$50,000.” **Inclusion/exclusion criteria:** Provided by study author: "Children with an allergy to the foods being served were not eligible to participate in the study. Parents and guardians provided informed written consent for both their own participation and that of their child." **Recruitment:** “Recruitment began in April 2008 by distributing letters to parents who had children aged 3–6 years enrolled in daycare at the Bennett Family Center at the University Park campus of The Pennsylvania State University.” **Recruitment rate:** Provided by study author: "100% of children whose parents signed consent form were included in the study" **Region:** Pennsylvania (USA)
Interventions	**Number of experimental conditions:** 4

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Spill 2010 *(Continued)*

Number of participants (analysed):

Overall = 51

Description of intervention:

One day a week for 4 weeks, children were provided with a first course and main course at lunch. Across the weeks the portion size of raw carrots and dip served as the first course of lunch was varied (30 g, 60 g, or 90 g) and during 1 week no first course was provided. Cooked broccoli was served as the vegetable with the main lunch course

Duration:

4 weeks

Number of contacts:

4 (1 day a week)

Setting:

Preschool

Modality:

Face-to-face

Interventionist

Preschool teacher

Integrity:

Provided by study author: "All children were served the food assigned in the experimental condition. There was no deviation from study protocol. No unplanned or unintended interventions."

Date of study:

Recruitment began in April 2008

Description of control:

N/A

Outcomes	**Outcome relating to children's fruit and vegetable consumption:** Child's consumption of vegetables for different first course portion sizes (grams). "Uneaten items were removed, and weights were recorded to the nearest 0.1 g with digital scales. Consumption of the foods and milk was determined by subtracting postmeal weights from premeal weights." **Outcome relating to absolute costs/cost effectiveness of interventions:** Not reported **Outcome relating to reported adverse events:** Not reported **Length of follow-up from baseline:** Unclear **Length of follow-up post-intervention:** Immediately **Subgroup analyses:**

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Spill 2010 *(Continued)*

Provided by study author: "Differences between girls and boys in age, body weight, height, BMI percentile, and BMI z-score were analyzed by using T tests. Analysis of covariance was used to assess the influence of continuous variables (age, body weight, height, BMI percentile, and BMI z-score) on the relation between carrot portion size and the main study outcomes. Children who consumed all of the carrots (95% of the weight served) at any meal were identified, and data were analyzed both with and without these children to determine whether they influenced the results. The effect of individual children who were influential on the main study outcomes was assessed."

Loss to follow-up:

There was no loss to follow-up

Analysis:

Unclear if adjusted for clustering

Sample size calculations performed.

Notes	Sensitivity analysis - primary outcome: Vegetable intake listed as primary outcome in trial registry.

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	“Children were enrolled from 5 classrooms; the order of the experimental conditions across study weeks was assigned to classrooms by using a Latin square design.” Provided by study authors: "The orders of the experimental conditions across study weeks were created using Latin squares and then assigned to classrooms using a random number generator."
Allocation concealment (selection bias)	Unclear risk	It is not clear who undertook randomisation of classrooms. Provided by study authors: "Classrooms (and the associated condition order) were assigned a color coding so that participants and teachers were uninformed of the experimental condition."
Blinding of participants and personnel (performance bias) All outcomes	Low risk	“Incidents of food and drink spillage were recorded by researchers. Teachers were instructed to redirect conversations pertaining to food to nonfood-related topics to minimize the influence on lunch intake.” Objective outcome measurement. Children were not blinded and it seems unlikely that this would influence their intake. Staff present during the meal and staff who served the food to children were not blinded and it seems unlikely this would influence child intake
Blinding of outcome assessment (detection bias) All outcomes	High risk	“Uneaten items were removed, and weights were recorded to the nearest 0.1 g with digital scales”. “Incidents of food and drink spillage were recorded by researchers.” Appears that researchers who weighed the food were the same researchers who recorded incidents of food and drink spillage. Researchers were not blinded and this may have had an impact on how the outcome was recorded in different classrooms
Incomplete outcome data (attrition bias) All outcomes	Low risk	“A total of 51 children were enrolled, and all of them completed the study” There were no children who dropped out over the study, very low risk of bias

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Spill 2010 *(Continued)*

Selective reporting (reporting bias)	Low risk	There is no study protocol and unable to determine if all prespecified outcomes have been reported as described Provided by study authors: "All outcomes collected were reported in the paper (vegetable and food intake)"
Other bias	Low risk	There are no other sources of potential bias

Spill 2011a

Methods	**Study design:** Randomised controlled trial – cross-over **Funding:** Provided by study author: *"Supported by the National Institute of Diabetes and Digestive and Kidney Diseases (R01 DK082580)."*
Participants	**Description:** Children aged 3-6 years attending 2 daycare centres at the University Park campus of The Pennsylvania State University **N (Randomised):** 49 children **Age:** Mean = 4.7 years **% Female:** 54% **SES and ethnicity:** “Of the 39 children, 28 children (72%) were white, 9 children (23%) were Asian, and 2 children (5%) were black or African American. Parents of the children had above average education levels and household incomes; ˜90% of mothers and 80% of fathers had a college degree, and 76% of households had an annual income >$50,000.” **Inclusion/exclusion criteria:** Provided by study author: "Children with an allergy to the foods being served were not eligible to participate in the study. Parents and guardians provided informed written consent for both their own participation and that of their child." **Recruitment:** “Recruitment began by distributing letters to parents with children aged 3–6 years who were enrolled in daycare at the Bennett Family Center or the Child Development Laboratory at the University Park campus of The Pennsylvania State University.” **Recruitment rate:** Provided by study author: "100% of children whose parents signed consent form were included in the study" **Region:**

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Spill 2011a *(Continued)*

	Pennsylvania (USA)
Interventions	**Number of experimental conditions:** 3 **Number of participants (analysed):** Overall = 39 **Description of intervention:** “The 3 experimental entrees were manipulated by adding pureed vegetables to a standard recipe (100% energy dense (ED) condition) to reduce the ED by either 15% (85% ED condition) or 25% (75% ED condition). Manipulated entrees were zucchini bread at breakfast, pasta with tomato-based sauce at lunch, and chicken noodle casserole at dinner and evening snack.” In addition unmanipulated side dishes and snacks were served, including fruit, vegetables, milk and cheese and crackers **Duration:** 3 weeks **Number of contacts:** 3 (1 day a week) **Setting:** Preschool **Modality:** Face-to-face **Interventionist** Provided by study author: "Preschool teacher" **Integrity:** Provided by study author: "All children were served the food assigned in the experimental condition. There was no deviation from study protocol. No unplanned or unintended interventions." **Date of study:** Between January and May 2010 **Description of control:** N/A
Outcomes	**Outcome relating to children's fruit and vegetable consumption:** Child’s consumption of vegetable for difference energy density entrees (grams). “Food and beverage weights were recorded to the nearest 0.1 g with digital scales (PR5001 and XS4001S; Mettler-Toledo Inc). The consumption of foods and beverages was determined by subtracting postmeal weights from premeal weights.” **Outcome relating to absolute costs/cost effectiveness of interventions:** Not reported **Outcome relating to reported adverse events:** Effect of intervention on amount of meal consumed

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Spill 2011a *(Continued)*

Length of follow-up from baseline:

Unclear

Length of follow-up post-intervention:

Immediately

Subgroup analyses:

Provided by study author: "ANCOVA was used to assess the influence of continuous subject variables (age, body weight, height, and BMI percentile) on the relation between entree energy dense (ED) and the main study outcomes. T tests were used to test differences between girls and boys in ages, body weights, heights, BMI percentiles, and BMI z scores."

Loss to follow-up:

Overall = 18%

Analysis:

Sample size calculations performed

Notes

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	The random sequence was generated with computer software
Allocation concealment (selection bias)	Unclear risk	”Random orders were generated with computer software and assigned to a list of participant identification numbers” The random sequence was assigned to a list of participant identification number, but it is unclear if allocation was concealed. Provided by study author: "Allocation was concealed to participants and teachers by assigning each child an ID number that was associated with their random order."
Blinding of participants and personnel (performance bias) All outcomes	Low risk	Vegetable intake: Objective measure of child’s vegetable intake and unlikely to be influenced by performance bias
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Vegetable intake: Objective measure of child’s vegetable intake and unlikely to be influenced by detection bias
Incomplete outcome data (attrition bias) All outcomes	High risk	49 children were enrolled, but 9 were excluded because they had difficulty following the protocol. Given an intention-to-treat approach to analysis was not used, the risk of attrition bias is high
Selective reporting (reporting bias)	Low risk	The primary outcomes reported in the paper align with those specified in the trial registration
Other bias	Low risk	Contamination bias that could threaten the internal validity is unlikely to be an issue

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Spill 2011b

Methods	**Study design:** Cluster-randomised controlled trial – cross-over **Funding:** Provided by study author: *"Supported by the National Institute of Diabetes and Digestive and Kidney Diseases (R01 DK082580)."*
Participants	**Description:** Children aged 3-5 years attending 2 daycare centres at the University Park campus of The Pennsylvania State University **N (Randomised):** 5 classrooms, 73 children **Age:** Range 3.3 to 5.7 years (mean = 4.7 years) **% Female:** 57% **SES and ethnicity:** “Parents of the children had above average education levels and household incomes; approximately 95% of mothers and 88% of fathers had a college degree and 70% of households had an annual income above $50,000.” “Parents provided demographic information for 66 of the 72 children; of these, 42 (67%) were white, 17 (27%) were Asian, and 4 (6%) were black or African American” **Inclusion/exclusion criteria:** Provided by study author: "Children with an allergy to the foods being served were not eligible to participate in the study. Parents and guardians provided informed written consent for both their own participation and that of their child." **Recruitment:** “Recruitment began by distributing letters to parents who had children within the age range of three to six years enrolled in two daycare centers on the University Park campus of The Pennsylvania State University.” **Recruitment rate:** Provided by study author: "100% of children whose parents signed consent form were included in the study" **Region:** Pennsylvania (USA)
Interventions	**Number of experimental conditions:** 4 **Number of participants (analysed):** Overall = 72 **Description of intervention:**

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Spill 2011b *(Continued)*

	"On one day a week for four weeks, children in a daycare setting were provided with breakfast, lunch, and afternoon snack. Across the weeks, the portion size of soup (tomato soup) served in the first course of lunch was varied (150, 225, or 300 g) and during one week no first course was provided. The foods and beverages served in the main course of lunch, as well as the foods and beverages served at breakfast and snack, were not varied in portion size." **Duration:** 4 weeks **Number of contacts:** 4 (1 day per week) **Setting:** Preschool **Modality:** Face-to-face **Interventionist:** Teachers **Integrity:** No information provided. **Date of study:** Provided by study author: "Data was collected from Dec. 2008 to Mar. 2009." **Description of control:** N/A
Outcomes	**Outcome relating to children's fruit and vegetable consumption:** Child's consumption of vegetable (grams): tomato consumed from soup + broccoli from main course, Broccoli only, Afternoon snack, Total (soup, broccoli and afternoon snack). Portion sizes of foods were provided and researchers recorded the amount consumed **Outcome relating to absolute costs/cost effectiveness of interventions:** Provided by study author: "Outside scope of this study; data not collected" **Outcome relating to reported adverse events:** Provided by study author: "Outside scope of this study; data not collected" **Length of follow-up from baseline:** Unclear **Length of follow-up post-intervention:** Immediately **Subgroup analyses:** Provided by study author: "Analysis of covariance was used to assess the influence of continuous subject variables (age, body weight, height, and BMI percentile) on the relationship between soup portion size and the main study outcomes. T-tests were used to test differences between girls and boys in age, body weight, height, and BMI percentile."

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Spill 2011b *(Continued)*

	Loss to follow-up: Overall = 1% **Analysis:** Provided by study author: "Classroom was tested as a factor in the model, but it was not significant and was removed." Sample size calculations performed.
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Provided by study author: "The orders of the experimental conditions across study weeks were created using Latin squares and then assigned to classrooms using a random number generator."
Allocation concealment (selection bias)	Unclear risk	Provided by study author: "Classrooms (and the associated condition order) were assigned a color coding so that participants and teachers were uninformed of the experimental condition."
Blinding of participants and personnel (performance bias) All outcomes	Low risk	Vegetable intake: Objective measure of child's vegetable intake and unlikely to be influenced by performance bias
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Vegetable intake: Researchers recorded the number of pieces of each food item taken by the child and it is unlikely that this would be influenced by detection bias
Incomplete outcome data (attrition bias) All outcomes	Low risk	72 out of 73 children were included in the vegetable intake analysis and therefore the risk of attrition bias is low
Selective reporting (reporting bias)	Low risk	Provided by study author: "All outcomes collected were reported in the paper (soup and food intake)"
Other bias	Low risk	Contamination, baseline imbalance, & other bias that could threaten the internal validity are unlikely to be an issue

Staiano 2016

Methods	**Study design:** Randomised controlled trial **Funding:** *"AES is supported, in part, by the 1 U54 GM104940 grant from the National Institute of General Medical Sciences of the National Institutes of Health, which funds the Louisiana Clinical and Translational Science Center (July, 2015 to June, 2017)."*
Participants	**Description:**

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Staiano 2016 *(Continued)*

Children aged 3 to 5 years attending at 2 full-day preschools

N (Randomised):

42 children

Age:

Mean: Food modelling DVD = 4.5 years, Non-food DVD = 4.1 years, No DVD (Control) = 4.3 years

% Female:

50%

SES and ethnicity:

Child: White = 74%, African American = 5%, Asian = 10%, Hispanic = 10%

Inclusion/exclusion criteria:

Not specified

Recruitment:

Not specified

Recruitment rate:

39% (42/108)

Region:

LA (USA)

Interventions

Number of experimental conditions: 3

Number of participants (analysed):

Food modelling DVD = 14

Non-food DVD = 14

No DVD (Control) = 14

Description of intervention:

Food modelling group = Copy-Kids Eat Fruits and Vegetables DVD

Non-food DVD group = Copy-Kids Brush Teeth.

Day 1: “Depending on the condition, on day 1 the child viewed 1 of 2 video clips or sat quietly for 7.5 minutes. Two plates of snacks (the modelled vegetable and a comparison food) were placed in front of the participant in a standardized format (green bell peppers on the right and dry cereal on the left) on separate, identical white Styrofoam plates. Children were instructed to eat as much or as little as they wished during this time. The video segments were played concurrently during the food presentation”

Day 2 and 7: “food items were presented for 7.5 minutes without the concurrent video presentation”.

Duration:

1 week ± 2 days

Number of contacts:

3

Setting:

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Staiano 2016 *(Continued)*

	Preschool **Modality:** Visual/audio - DVD **Interventionist:** Unclear **Integrity:** No information provided **Date of study:** Unknown **Description of control:** No DVD Control: food items were presented the same way as in the intervention but no DVD was played on any of the 3 exposure days
Outcomes	**Outcome relating to children's fruit and vegetable consumption:** Child's consumption of vegetable (grams). "Study staff weighed 0.5 cups of the modeled vegetable (ie, approximately 80 g of raw, sliced green bell pepper) and 0.5 cups of the comparison food (ie, approximately 16 g of Multi Grain Cheerios; General Mills, Minneapolis, MN) using a transportable scale before and after snack presentation on days 1, 2, and 7." **Outcome relating to absolute costs/cost effectiveness of interventions:** Not reported **Outcome relating to reported adverse events:** Not reported **Length of follow-up from baseline:** 1 week ± 2 days **Length of follow-up post-intervention:** Immediately **Subgroup analyses:** None **Loss to follow-up:** There was no loss to follow-up **Analysis:** Unknown if sample size calculations performed.
Notes	Outcome data from the longest follow-up < 12 months (day 7). We estimated the mean and SEM from a study figure using an online resource (Plot Digitizer: plotdigitizer.sourceforge.net) for all 3 groups. We combined the control DVD and control conditions into a single control group for inclusion in meta-analysis. Sensitivity analysis - primary outcome: Primary outcome not stated, fruit or vegetable intake 1st listed outcome in abstract

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Staiano 2016 *(Continued)*

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	"used block randomization to distribute age and sex evenly across conditions using a randomization schedule generated with SAS programming" The random sequence was generated using statistical software, SAS
Allocation concealment (selection bias)	Unclear risk	There is no information provided about allocation concealment and therefore it is unclear if allocation was concealed
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Vegetable intake (weighed): Objective measure of child's vegetable intake and unlikely to be influenced by performance bias Parent reported fruit and vegetable consumption: There is no blinding to group allocation of participants or personnel described and this is likely to influence performance. However, it does appear that parents were blinded to the food provided to their children. "Researchers did not inform parents regarding which foods were presented to the children."
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Vegetable intake (weighed): Objective measure of child's vegetable intake and unlikely to be influenced by detection bias Parent reported fruit and vegetable consumption: There is no blinding to group allocation of participants or personnel described and these are self-reported measures. However, "Researchers did not inform parents regarding which foods were presented to the children."
Incomplete outcome data (attrition bias) All outcomes	Low risk	All participants randomised completed the study. Therefore very low risk of attrition bias
Selective reporting (reporting bias)	Unclear risk	There is no study protocol therefore it is unclear if there was selective outcome reporting
Other bias	Unclear risk	The authors state that limitations included potential for within-school contamination across conditions. No other evidence presented about this potential bias

Sullivan 1994

Methods	**Study design:** Randomised controlled trial **Funding:** Supported by the Gerber Products company and National Institutes of Health Grant 2RO0HD197S2-07
Participants	**Description:** Mothers and their 4 to 6-month old infants

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Sullivan 1994 *(Continued)*

N (Randomised):

36 children

Age:

Child (mean): 22 weeks (17-27 weeks)

% Female:

56%

SES and ethnicity:

Not reported

Inclusion/exclusion criteria:

"The 36 infants and their mothers who participated met the following criteria: 1. Infants were between 4 and 6 months of age at the beginning of the study; 2. Parents had just begun feeding solid foods and had only given cereals or cereals and fruits; 3. Parents indicated readiness to begin or continue introducing solid foods to the infant; and 4. Absence of medical complications or physical problems."

Recruitment:

"Subjects were solicited through birth records and advertisements in local newspapers."

"Parents were contacts and informed of the study before the time their infants would be expected to be introduced to solid foods and contact was reestablished when they were ready to participate."

Recruitment rate:

Unknown

Region:

USA

Interventions

Number of experimental conditions: 4

Number of participants (analysed):

Peas salted: 9

Peas unsalted: 10

Green beans salted: 8

Green beans unsalted: 9

Description of intervention:

"Foods used throughout the study, pureed peas and green beans, were prepared especially for the study by the Gerber Products Company. Salted and unsalted versions of the two vegetables were prepared. The salted version of each food contained 0.3g NaCl/100g. The foods were presented to the mothers in jars, containing 71g of food and labels did not indicate the presence or absence of salt."

Duration:

10 days

Number of contacts:

10 (once per day)

Setting:

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Sullivan 1994 *(Continued)*

	Home **Modality:** Face-to-face **Interventionist:** Parents **Integrity:** “On each feeding occasion, parents completed a brief form noting information on the number of the jar used (1through 10), date of feeding, time at the start and end of the feed, infant state of alertness at the beginning of the feed, health of the infant, and the overall quality of the interaction during the feeding.” **Date of study:** Unknown **Description of control:** N/A
Outcomes	**Outcome relating to children's fruit and vegetable consumption:** Children’s consumption of vegetable (grams): Weighed jars of off before feeding session, resealed and frozen once feeding was finished. Jars collected and weighed by research team to determine grams of intake. **Outcome relating to absolute costs/cost-effectiveness of interventions:** Not reported **Outcome relating to reported adverse events:** No adverse reactions were observed **Length of follow-up from baseline:** 25 days **Length of follow-up post-intervention:** Immediately and at 1 week **Subgroup analyses:** None **Loss to follow-up:** There was no loss to follow-up **Analysis:** Unknown if sample size calculation was performed
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement

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Sullivan 1994 *(Continued)*

Random sequence generation (selection bias)	Unclear risk	"The 36 infants were randomly assigned to receive either salted or unsalted peas or green beans; thus forming a total of four treatment groups." No mention of how the randomisation sequence was generated.
Allocation concealment (selection bias)	Unclear risk	There is no mention of allocation concealment.
Blinding of participants and personnel (performance bias) All outcomes	Low risk	"The foods were presented to the mothers in jars, containing 71 g of food, and labels did not indicate the presence or absence of salt."
Blinding of outcome assessment (detection bias) All outcomes	Low risk	"All ratings were made while mothers and the research assistant were blind to whether infants were fed peas or beans, whether the feedings observed occurred before or after the repeated exposures, and whether or not the infants were being fed salted or unsalted vegetables."
Incomplete outcome data (attrition bias) All outcomes	Low risk	There is no attrition reported.
Selective reporting (reporting bias)	Unclear risk	There is no trial registration or protocol paper.
Other bias	Low risk	No other sources of bias were identified.

Tabak 2012

Methods	**Study design:** Randomised controlled trial **Funding:** *"Funding for this research was provided by an unrestricted grant from ''Get Kids in Action,'' a partnership between the Gatorade Corporation and the University of North Carolina."*
Participants	**Description:** Children aged 2 to 5 years and their parent **N (Randomised):** 50 parent-child dyads **Age:** Child (mean): Intervention = 3.9 years, Control = 3.3 years Parent (mean): Intervention = 36.6 years, Control = 36.2 years **% Female:** Child: Intervention = 59%, Control = 67% Parent: Intervention = 86%, Control 90% **SES and ethnicity:**

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Tabak 2012 *(Continued)*

Parent (non-white): Intervention = 18%, Control = 10%

Income (USD):

< 50,000: Intervention = 18%, Control = 81%

≥ 50,000: Intervention = 77%, Control = 19%

Education:

College or less: Intervention = 36%, Control = 43%

Inclusion/exclusion criteria:

At least 1 child 2 - 5 years old, "Additional eligibility criteria included having lived in their current residence and planning to stay in that residence for at least 6 months. If the family had more than 1 eligible child, the eldest was selected as the reference child"

Recruitment:

"A convenience sample of 50 parent-child dyads, with at least 1 child 2-5 years old, was recruited through child care centers, listservs, and community postings. Interested parents responded to recruitment materials and were screened by phone."

Recruitment rate:

Unknown

Region:

USA

Interventions

Number of experimental conditions: 2

Number of participants (analysed):

Intervention = 22, control = 21

Description of intervention:

"addressed vegetable and food issues based on the baseline surveys, and the dietitian helped parents select 1 primary target area for improvement during the intervention from 4 possible options (vegetable availability; picky eating; modeling; family meals). These areas were selected based on Social Cognitive Theory, which posits that there is reciprocal interaction between an individual and his/her environment. This theory also highlights the importance of self-efficacy, which was thus a target of the intervention as well."

Duration:

4 months

Number of contacts:

6 (2 phone calls, 4 newsletters)

Setting:

Home

Modality:

Multiple (telephone, newsletters)

Interventionist:

A registered dietitian

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Tabak 2012 *(Continued)*

	Integrity: No information provided **Date of study:** April and December 2009 **Description of control:** "Control group families received 4 non-health/nutrition related children's books, 1 per month."
Outcomes	**Outcome relating to children's fruit and vegetable consumption:** Child's consumption of vegetables (servings per day) assessed using a Block Kids food frequency questionnaire (FFQ) completed by parents. **Outcome relating to absolute costs/cost effectiveness of interventions:** Not reported **Outcome relating to reported adverse events:** Not reported **Length of follow-up from baseline:** 5 months **Length of follow-up post-intervention:** Immediate **Subgroup analyses:** None **Loss to follow-up:** Intervention = 12% Control = 16% **Analysis:** Unknown if sample size calculations performed
Notes	To enable inclusion in meta-analysis, we calculated post-intervention means by group by summing baseline and change from baseline means, and assumed baseline SDs for post-intervention SDs. Sensitivity analysis - primary outcome: Primary outcome not stated, fruit or vegetable intake 2nd listed outcome after height and weight

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Randomly allocated to experimental group but the random sequence generation procedure is not described
Allocation concealment (selection bias)	Unclear risk	There is no information provided about allocation concealment and therefore it is unclear if allocation was concealed

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Tabak 2012 *(Continued)*

Blinding of participants and personnel (performance bias) All outcomes	High risk	Child vegetable intake (parent reported): There is no blinding to group allocation of participants or personnel described and this is likely to influence performance
Blinding of outcome assessment (detection bias) All outcomes	High risk	Child vegetable intake (parent reported): There is no blinding to group allocation of participants or personnel described and because this is a parent-reported measure at high risk of detection bias
Incomplete outcome data (attrition bias) All outcomes	Low risk	43 (86%) of the 50 parent-child dyads recruited completed the study. Therefore at low risk of attrition bias
Selective reporting (reporting bias)	Unclear risk	There is no study protocol therefore it is unclear if there was selective outcome reporting
Other bias	Low risk	Contamination bias that could threaten the internal validity is unlikely to be an issue

Vazir 2013

Methods	**Study design:** Cluster-randomised controlled trial **Funding:** *"Indian Council of Medical Research, India and the NIH/NICHD (5 R01 HD042219-S1); additional funding from UNICEF, New York."*
Participants	**Description:** Mothers and their infants from 60 villages in India **N (Randomised):** 60 villages (clusters), 607 mother-infant dyads **Age:** Child: "The intervention began with infants are about 3 months old" Mother (mean): Complementary feeding group: 22.3 years, Responsive complementary feeding and play group: 22.3 years, Control group: 21.9 years **% Female:** Child: Complementary feeding group = 52%, Responsive complementary feeding and play group = 51%, Control group = 49% Parent: 100% **SES and ethnicity:** Percentage mothers finished secondary or high school: Complementary feeding group = 25%, Responsive complementary feeding and play group = 32%, Control group = 27%. Mean standard of living index score: Complementary feeding group = 25.6, Responsive complementary feeding and play group = 25.3, Control group = 26.3

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Vazir 2013 *(Continued)*

Inclusion/exclusion criteria:

Inclusion: had to be part of the 'Integrated Child Development Services' project areas, be pregnant in their third trimester

No exclusion criteria mentioned in text but in figure states "excluded as per criteria: microcephaly, physical handicap, mother mentally handicapped, cerebral palsy, thalassemia, child passes away."

Recruitment:

"We explained the study objectives to all the pregnant women in the villages and asked if they would like to participate in the study. There were no refusals."

Recruitment rate:

100%

Region:

India

Interventions	**Number of experimental conditions:** 3 **Number of participants (analysed):** Complementary feeding group = 170 Responsive complementary feeding and play group = 145 Control group = 168 **Description of intervention:** Complementary feeding group: "In addition to the 'Integrated Child Development Services', mothers in this group received 11 nutrition education messages on sustained breastfeeding and complementary feeding through twice-a-month or four times a month (depending on the age of the infant) home-visits over 12 months by the trained village women using flip charts, other visual material, demonstrations and counselling sessions." Responsive complementary feeding and play group: "In addition to the 'Integrated Child Development Services', mothers in this group received education on complementary feeding as in the complementary feeding group (11 messages), eight messages and skills on responsive feeding, and eight developmental stimulation messages using five simple toys. This group of mothers also received developmentally appropriate toys five times during the intervention with instructions on how to use them to engage and play with their children." **Duration:** 12 months **Number of contacts:** 30 planned visits "The first visits were in the fourth month, after the baseline when infants were 3 months old. From 4 to 6 months, mothers were visited twice per month, or 6 visits; from 7 to 9 months, they were visited 4 times a month, or 12 visits; and from 10 to 14 months, they were visited twice a month, or 12 visits," **Setting:** Home + centre-based supplemental food **Modality:** Face-to-face **Interventionist:**

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Vazir 2013 *(Continued)*

	The trained village women **Integrity:** "Trained graduates in nutrition supervised the village women, examined their records of visits and asked mothers independently what they were told in the village woman's' last visit. They also held periodic reinforcement training sessions with the village women." **Date of study:** Unknown **Description of control:** "Control group (CG): Mothers and infants in this group received only the routine 'Integrated Child Development Services', which were operating across all study groups. These services consist mainly of centre-based supplemental food provided to 1–6-year-olds, pregnant and nursing mothers, home-visit counselling on breastfeeding and complementary feeding, monthly growth monitoring, and non-formal preschool education for children 3–5 years of age."
Outcomes	**Outcome relating to children's fruit and vegetable consumption:** Child's consumption of banana, spinach, pulses (legumes): "Dietary intake was evaluated by the 24-h recall method using standard cups with specified volume to help recall the food serving amounts." **Outcome relating to absolute costs/cost-effectiveness of interventions:** Not reported **Outcome relating to reported adverse events:** Not reported **Length of follow-up from baseline:** 12 months **Length of follow-up post-intervention:** Immediately **Subgroup analyses:** None **Loss to follow-up:** Overall: 15% **Analysis:** Adjusted for clustering Sample size calculations performed
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	"The random allocation using a random number generator (facilitated through a tailor-made syntax programme in the Statistical Package for the Social Sciences (SPSS), which uses the select cases function) was undertaken by a re-

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Vazir 2013 *(Continued)*

		searcher who was not familiar with the villages or their characteristics other than what could be derived from the 2001 census data."
Allocation concealment (selection bias)	Unclear risk	There is no mention of allocation concealment.
Blinding of participants and personnel (performance bias) All outcomes	High risk	Both the village women (VW) delivering the intervention, and mothers receiving the intervention were likely to be aware of their experimental group allocation.
Blinding of outcome assessment (detection bias) All outcomes	Low risk	"The assessment teams (psychologists and nutritionists) were blinded to the intervention and had no interaction with the VWs. They did not meet as they used different transport and timetable of activities. The villages had no identification mark to indicate the group to which they had been randomized."
Incomplete outcome data (attrition bias) All outcomes	Low risk	"After 12 months of intervention and consequent attrition (15%), the sample comprised 511 mothers and children with 182 in CG, 176 in CFG and 153 in the RCF&PG. All 60 clusters remained in the study. Loss to follow-up was greater in the RCF&PG (22%) compared with the CG (9%) and CFG (16%) although this difference was not statistically significant." "Reasons for follow-up losses during the study were migration (9.2%), house found locked on repeated visits (4.7%) and death of the child (1%). The demographic characteristics of those lost to follow-up and those who remained were not different." Loss to follow-up was uneven across the study arms (not stat significant), but were not due to the trial. No loss of clusters
Selective reporting (reporting bias)	Unclear risk	There is no trial registration or protocol paper.
Other bias	Low risk	Recruitment bias: (low) "We explained the study objectives to all the pregnant women in the villages and asked if they would like to participate in the study. There were no refusals." Baseline imbalance: (low) "There were no significant differences among the three groups in any of the baseline characteristics" Loss of clusters: (low) "All 60 clusters remained in the study." Incorrect analysis: (low) "Values presented in the text and tables are means & standard deviations at the individual level and ICCs are presented to quantify the clustering effects"

Verbestel 2014

Methods	**Study design:** Cluster-randomised controlled trial **Funding:** *"The work was supported by the Ministry of the Flemish Community (Department of Economics, Science and Innovation; Department of Welfare, Public Health and Family)."*
Participants	**Description:**

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Verbestel 2014 *(Continued)*

Children aged 9 to 24 months enrolled at daycare centres in 6 different communities in Flanders (Belgium)

N (Randomised):

70 day care centres, 203 children

Age:

Mean: Intervention = 15.8 months, Control = 14.9 months

% Female:

Intervention = 47%, Control = 44%

SES and ethnicity:

Low SES: Intervention = 13%, Control = 24%

Inclusion/exclusion criteria:

No explicit inclusion criteria stated for this trial

Children were excluded if they were not present in daycare on the measurement day for objective height and weight at baseline (i.e. not fulfilling the minimum criteria to be included in the study)

Recruitment:

"Within each day-care centre, parents of all children aged 9–24 months were invited to enrol their child in the study."

Recruitment rate:

50% (203/404)

Region:

Flanders (Belgium)

Interventions

Number of experimental conditions: 2

Number of participants (analysed):

Intervention = 100, control = 56

Description of intervention:

"The intervention aimed at increasing daily consumption of water (instead of soft drinks), milk, fruit and vegetables, increasing daily physical activity and decreasing daily consumption of sweets and savoury snacks and daily screen-time behaviour."

"programme that consisted of two components: (i) guidelines and tips presented on a poster and (ii) a tailored feedback form for parents about their children's activity- and dietary related behaviours."

Duration:

12 months

Number of contacts:

Unclear

Setting:

Preschool

Modality:

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Verbestel 2014 *(Continued)*

	Face-to-face **Interventionist:** Researchers **Integrity:** No information provided **Date of study:** 2008 to 2009 **Description of control:** No information provided
Outcomes	**Outcome relating to children's fruit and vegetable consumption:** Child's consumption of fruit and vegetables assessed using a 24-item semi-quantitative food frequency questionnaire (FFQ) completed by parents. **Outcome relating to absolute costs/cost effectiveness of interventions:** Not reported **Outcome relating to reported adverse events:** Not reported **Length of follow-up from baseline:** 12 months **Length of follow-up post-intervention:** Immediate **Subgroup analyses:** None **Loss to follow-up:** Intervention = 21% Control = 14% **Analysis:** Did not adjust for clustering Unknown if sample size calculations performed
Notes	First reported outcome (grams fruit/day) was extracted for inclusion in the meta-analysis. The reported estimate that adjusted for clustering did not report 95% CI or SEM. Therefore we used final values and calculated an effective sample size using ICC of 0.016 to enable inclusion in meta-analysis. Sensitivity analysis - primary outcome: Primary outcome not stated, fruit or vegetable intake 2nd listed outcome after BMI

Risk of bias

Bias	Authors' judgement	Support for judgement

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Verbestel 2014 *(Continued)*

Random sequence generation (selection bias)	Unclear risk	Randomly allocated to experimental group but the random sequence generation procedure is not described
Allocation concealment (selection bias)	Unclear risk	There is no information provided about allocation concealment and therefore it is unclear if allocation was concealed
Blinding of participants and personnel (performance bias) All outcomes	High risk	Fruit and vegetable intake (parent reported): Parents were not blinded to group allocation and this is likely to influence performance
Blinding of outcome assessment (detection bias) All outcomes	High risk	Fruit and vegetable intake (parent reported): Parents were not blinded to group allocation and this is likely to influence performance
Incomplete outcome data (attrition bias) All outcomes	High risk	FT: Of 203 children, 156 (77%) were re-examined 12 months later at follow-up (this is the first follow-up post-intervention). If we define this as short-term follow-up, this is high risk of bias as > 20% dropout
Selective reporting (reporting bias)	Unclear risk	There is no study protocol therefore it is unclear if there was selective outcome reporting
Other bias	High risk	Baseline imbalance: Baseline differences were observed between the control and intervention groups in sociodemographic characteristics and body composition. However although this was adjusted for in the analysis the impact of this imbalance is unclear. “The analyses were adjusted for SES, age of the child and BMI z-score at baseline to control for the observed baseline imbalance in these variables between intervention and control groups.” Recruitment bias: Appears that parents and childcare centres were recruited after communities had been matched and randomised - high risk Incorrect analyses: Linear mixed models adjusted for clustering within daycare centres, but standard errors were not reported. Reported mean (SD) by group at follow-up and calculation of effective sample sizes prior to inclusion in meta-analyses accounted for this, therefore low risk.

Vereecken 2009

Methods	**Study design:** Cluster-randomised controlled trial **Funding:** *"The development of the intervention was funded by the PWO(Project-related Scientific Research)-funding of University College Arteveldehogeschool. Funds for the evaluation were provided by the Provincial Government East-Flanders."*
Participants	**Description:** Children attending 16 preschools in East Flanders (Belgium) **N (Randomised)** 16 preschools, 1432 preschoolers

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Vereecken 2009 *(Continued)*

Age: (DOB)

< 2002: intervention = 41%, control = 51%

2002: intervention = 28%, control = 24%

2003: intervention = 31%, control = 26%

% Female:

Intervention = 53%, control = 44%

SES and ethnicity:

Predominantly low parental education

Low education (mother): intervention = 49%, control = 49%

Low education (father): intervention = 60%, control = 57%

Ethnicity: No information provided

Inclusion/exclusion criteria:

Not specified

Recruitment:

Schools were approached by mail for consent. All parents of preschoolers attending the consenting schools were asked to fill in a food frequency questionnaire

Recruitment rate:

Parents: 54%

Schools: 10% (40 out of 403 schools consented, although only 8 were selected in the end)

Region:

East Flanders (Belgium)

Interventions

Number of experimental conditions: 2

Number of participants (analysed):

Intervention = 308, Control = 168

Description of intervention:

8 preschools received a multi-component intervention to assist schools to implement a healthy school food policy. "The main objectives were to increase the consumption of fruit, vegetables and water and to decrease the consumption of sugared milk drinks and fruit juice."

The main strategies to influence the child and the different environmental factors included:

"Child: Guided and self-guided activities based on experiential education (e.g. tasting) and developmental education (e.g. explanation of concepts of food triangle); Role model, feed back and reinforcement by teachers; Educational role-model story and characters; Availability of healthy foods; Availability of cooking equipment.

Parents: Newsletters; Suggestions for the back and forth diary; Work sheets and creations by children; Parent evenings and other school activities with parents

Teacher: Training sessions; Manual including didactic and policy aspects; Digital learning environment; Newsletters; Group discussions with teachers; Examples of good practices

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Vereecken 2009 *(Continued)*

	School environment: Newsletters; Training sessions for principals and cafeteria staff; Help on demand via e-mail; Examples of good practices; Policy aspects in the teachers' manual; Feedback to schools." **Duration:** 6 months **Number of contacts:** Unclear (multicomponent) **Setting:** Preschool **Modality:** Multiple (staff training, experiential education, newsletters, email support, resources) **Interventionist:** Not specified **Integrity:** No information provided **Date of study:** Sept 2006 - April 2007 **Description of control:** 8 preschools received the control: no information provided
Outcomes	**Outcome relating to children's fruit and vegetable consumption:** Daily consumption of fresh fruit and vegetables (grams) as reported by parents in a written food frequency questionnaire **Length of follow-up from baseline:** 6 months (March/April 2007) **Length of follow-up post-intervention:** Immediate **Subgroup analyses:** None **Loss to follow-up** Intervention: 47% Control: 45% **Analysis:** Contact with the author indicated that the analysis was adjusted for clustering by school Unknown if sample size calculation was performed
Notes	Trial results are reported as change from baseline in mean daily consumption of fruit and vegetables and post-intervention values. No standard deviations were reported for post-intervention data to enable inclusion in meta-analysis

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Vereecken 2009 *(Continued)*

Sensitivity analysis - primary outcome: Fruit or vegetable intake is primary outcome

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Contact with the author indicated that a computerised random-number generator was used
Allocation concealment (selection bias)	Unclear risk	Contact with the author indicated that schools did not know their allocation prior to consenting to the study. It is unclear if study personnel responsible for recruitment were aware of group allocation
Blinding of participants and personnel (performance bias) All outcomes	High risk	Contact with the author indicated that parents and school staff were not blind to group allocation and that parents could have attended information sessions organised by the researchers, or observed posters, newsletters or intervention materials in intervention schools. Given that the relevant trial outcomes were based on parental reports, the review authors judged that there was a risk of bias
Blinding of outcome assessment (detection bias) All outcomes	High risk	Contact with the author indicated that parents and school staff were not blind to group allocation and that parents could have attended information sessions organised by the researchers, or observed posters newsletters or intervention materials in intervention schools. Given that the relevant trial outcomes were based on parental reports, the review authors judged that there was a risk of bias. (NB. There were no independent outcome assessors in this trial; the parents completed and returned a food frequency questionnaire about their child's food intake)
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Although similar across groups (intervention = 47%, control = 45%), rates of loss to follow-up were high. Contact with the author indicated that no information was collected on reasons for loss to follow-up
Selective reporting (reporting bias)	Unclear risk	Insufficient information to permit judgement
Other bias	Low risk	Contact with the author indicated that analysis was adjusted for clustering No further risk of bias identified

Wardle 2003a

Methods	**Study design:** Randomised controlled trial **Funding:** Not reported
Participants	**Description:** Children aged 2 to 6 years and their principal caregiver (parent) who were recruited from a larger study **N (Randomised):** 156 children **Age:**

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Wardle 2003a *(Continued)*

Child: 34 to 82 months (mean = 53 months)

Parent: mean = 36 years

% female:

Children (by group): Exposure = 34%, Nutrition Information = 58%, Control = 51%

Parent (overall): 95%

SES and ethnicity:

"68% of parents had left full-time education at the age of 21 or over" and "the majority of parents held further education qualifications."

Ethnicity = 74% white

Inclusion/exclusion criteria:

No explicit inclusion/exclusion criteria stated for this trial, or for the trial from which participants were recruited. 13 children (1 girl, 12 boys) were excluded when they did not comply with the experimental procedures during the pre-experimental taste test

Recruitment:

Participants were recruited from a larger study on the predictors of children's fruit and vegetable intake and expressed an interest in participating in further research to modify their children's acceptance of vegetables

Recruitment rate:

Parents: 28%

Region:

United Kingdom

Interventions

Number of experimental conditions: 3

Number of participants (analysed):

i) Restricted to at least 10 out of 14 exposures:

Exposure = 34, Nutrition Information = 48, Control = 44

ii) All available data:

Exposure = 48, Nutrition Information = 48, Control = 44

Description of intervention:

Exposure: Taste exposure intervention carried out in the home where parents were asked to offer their child a taste of a target vegetable daily for 14 consecutive days. Parents were given suggestions to encourage the child to taste the vegetable. Parents were given a vegetable diary to record their experiences, and children could record their liking for the vegetable after each session using 'face' stickers.

Nutrition Information: Parents were informed about the '5 a day' recommendations and given a leaflet with advice and suggestions for increasing children's fruit and vegetable consumption

Duration:

14 days

Number of contacts:

14 (daily for 14 consecutive days)

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Wardle 2003a *(Continued)*

	Setting: The home **Modality:** Face-to-face, exposure **Interventionist:** Researchers trained parents to offer the target vegetable to their child **Integrity:** 14 participants in the exposure group failed to complete a minimum of 10 out of 14 tasting sessions. - 4 children completed 9 sessions, 2 completed 8 sessions, 2 completed 7 sessions, 1 completed 6 sessions, 4 completed 5 or less sessions **Date of study:** Not provided **Description of control:** "No treatment" control - parents received no further intervention
Outcomes	**Outcome relating to children's fruit and vegetable consumption:** As-desired consumption of target vegetable (grams) assessed by weighing the amount of the vegetable on the plate before and after consumption using a professional digital scale (Tanita Corporation, Japan) **Length of follow-up from baseline:** Approximately 2 weeks **Length of follow-up post-intervention:** Immediate **Subgroup analyses:** Restricted sample to only those in the taste exposure group who received 10 or more exposures. This restricted the Exposure group from 48 to 34 children. **Loss to follow-up:** 2% (140 provided follow-up data of 143 who were eligible and provided data at baseline). Exposure: 4% (children withdrawn from their study by their parents following collection of baseline data). Nutrition Information: 0% Control: 2% (children withdrawn from their study by their parents following collection of baseline data). **Analysis:** Adjustment for clustering not applicable Unknown if sample size calculation was performed
Notes	"Two sets of analyses were carried out: (a) on a restricted sample which excluded those in the Exposure group who completed less than 10 tasting sessions (n=126) and (b) on the whole sample (n=140).

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Wardle 2003a *(Continued)*

Results below refer to the reduced sample size ... results for the whole sample are only included where they differed from these."

Sensitivity analysis - primary outcome: Primary outcome not stated, fruit or vegetable intake 3rd listed outcome after rated and ranked liking.

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	"Participants were randomly assigned to one of three experimental treatment groups". No further information provided regarding sequence generation
Allocation concealment (selection bias)	Low risk	Contact with the author indicated that allocation was concealed in an opaque envelope opened at participant's homes after baseline data collection
Blinding of participants and personnel (performance bias) All outcomes	Low risk	Contact with the author indicated that personnel delivering the intervention were not blind to group allocation and that parents may not have been blind to group allocation. However, given the objective assessment of outcome (electronic scales), the review authors judged that the study outcome was unlikely to be affected by lack of blinding
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Contact with the author indicated that the outcome assessors were not blind to group allocation. Given the objective measure of outcome (electronic scales), assessment is unlikely to have been influenced by lack of blinding
Incomplete outcome data (attrition bias) All outcomes	Low risk	Rates of loss to follow-up were similar and low across the exposure (4%), nutrition information (0%) and the control conditions (2%). Reasons for loss to follow-up were provided and were similar
Selective reporting (reporting bias)	Unclear risk	Insufficient information to permit judgement
Other bias	Low risk	No further risk of bias identified

Watt 2009

Methods	**Study design:** Randomised controlled trial **Funding:** *"This work was commissioned by the Food Standards Agency in 2009 and supported by the Department of Health (UK) from 2010."*
Participants	**Description:** New mothers attending baby clinics in disadvantaged London neighbourhoods **N (Randomised):** 312 mothers **Age:** Children: mean = 10 weeks Parents: mean = 30 years

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Watt 2009 *(Continued)*

% Female:

Children = not stated

Parents = 100%

SES and ethnicity:

28% lone parents

57% living in social housing

33% receiving income support/job seeker's allowance

Ethnicity: 50% from an ethnic minority

Inclusion/exclusion criteria:

Inclusion criteria: "Women from Registrar General occupational classes II-V (non-professional); babies born >/= 37 weeks; babies' birth weight above 2500g; singletons; women able to understand written and spoken English; and resident in the study area."

Exclusion criteria: "Women aged under 17 years; infants were diagnosed with a serious medical condition or were on special diets; infants aged over 12 weeks; women or their partners were from social class I (professional). Originally their intention was to restrict the sample to first-time mothers over the initial 12 week recruitment period. The inclusion criteria was therefore changed to include all new-mothers."

Recruitment:

"Women were recruited from December 2002 to February 2004 at baby clinics located in the more disadvantaged neighbourhoods across Camden and Islington where Surestart (a national social welfare initiative targeting families with young children) programmes existed. A standardised technique was used to approach new mothers attending the baby clinics. An overview of the study was given and randomisation explained. If the women were interested, a short screening questionnaire was then used to assess their eligibility."

Recruitment rate:

Mothers: 82%

Region:

London, UK

Interventions

Number of experimental conditions: 2

Number of participants (analysed):

Intervention = 124, Control = 115 **(12 months)**

Intervention = 108, Control = 104 **(18 months)**

Description of intervention:

A monthly home visiting programme (from 3 to 12 months) delivered by trained local mothers, providing practical support on infant-feeding practices.

Duration:

9 months (duration of each visit = 60 min)

Number of contacts:

Monthly from 3 to 12 months (maximum = 10 contacts)

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Watt 2009 *(Continued)*

	Setting: The home **Modality:** Face-to-face, via home-visiting **Interventionist:** Trained local volunteers "A group of local mothers were recruited and trained to provide the support in a 12-session programme delivered over a 4-week period." **Integrity:** "On average each woman in the intervention group received five volunteer home visits (range 1-10). A small number of women were also contacted by telephone when home visits were not possible." **Date of study:** Recruited from Dec 2002 to Feb 2004 **Description of control:** Usual care. "Women in the control group only received standard professional support from health visitors and GPs."
Outcomes	**Outcome relating to children's fruit and vegetable consumption:** Children's intake of vitamin C from fruit Secondary outcome: Proportion of children who consumed specific fruits and vegetables more than once a week **Length of follow-up from baseline:** 9 months and 15 months (when children aged 12 months and 18 months, respectively) **Subgroup analyses:** None **Loss to follow-up: (at 9 and 15 months)** Intervention: 27%, 34% Control: 20%, 30% **Analysis:** Adjustment for clustering not applicable Sample size calculation was performed
Notes	Vitamin C (mg) from fruit at the longest follow-up < 12 months (9 months - children aged 12 months) and ≥ 12 months (15 months - children aged 18 months old) was extracted for inclusion in meta-analysis. Sensitivity analysis - primary outcome: Vitamin C intake from fruit listed as primary outcome

Risk of bias

Bias	Authors' judgement	Support for judgement

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Watt 2009 *(Continued)*

Random sequence generation (selection bias)	Low risk	"A random allocation schedule was prepared in advance using random digit computer tables."
Allocation concealment (selection bias)	Low risk	"Those responsible for recruiting ... were all masked to group assignment."
Blinding of participants and personnel (performance bias) All outcomes	High risk	Contact with the author indicated that parent participants and intervention personnel were not blind to group allocation. Given that the trial outcome was based on parental reports of children's fruit intake, the review authors judged that there was a risk of performance bias in this study
Blinding of outcome assessment (detection bias) All outcomes	Low risk	"Those responsible for ... assessing outcomes were all masked to group assignment."
Incomplete outcome data (attrition bias) All outcomes	High risk	Rates of loss to follow-up were similar across intervention (27%, 34%) and control (20%, 30%) groups at both time points and were moderate. There were no substantial differences in the reasons for loss to follow-up
Selective reporting (reporting bias)	Low risk	All primary or secondary outcomes of interest were reported according to the information provided in the trial register (ISRCTN 55500035)
Other bias	Low risk	Contamination bias that could threaten the internal validity is unlikely to be an issue

Williams 2014

Methods	**Study design:** Cluster-randomised controlled trial **Funding:** *"This research was supported by US Department of Agriculture's (USDA) Food and Nutrition Service (FNS)."*
Participants	**Description:** Children attending childcare centres participating in the Child and Adult Care Food Program and their parent **N (Randomised):** 24 childcare centres, 1143 parent-child dyads **Age:** Child: mean = 4.4 years Parent: "Overall, 67% of respondents were between the ages of 18 and 34" **% Female:** Child = 48% Parent: not specified **SES and ethnicity:** Parent: "40% were Hispanic or Latino; 24% were white, non-Hispanic; 27% were black, non-Hispanic; and 9% were another race or more than one race"

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Williams 2014 *(Continued)*

Inclusion/exclusion criteria:

Not specified

Recruitment:

"The study sampled child-care centers participating in the Child and Adult Care Food Program in New York"

"Approximately 5 to 6 weeks before the start of the intervention in spring 2010, teachers sent children home with a study invitation and the baseline survey. Parents who agreed to participate in the study were asked to return a contact information card and the completed questionnaire in a separate envelope to preserve confidentiality."

Recruitment rate:

Parent: 75% (1143/1518)

Region:

New York (USA)

Interventions

Number of experimental conditions: 2

Number of participants (analysed):

Intervention = 440, control = 462

Description of intervention:

Eat Well Play Hard in Child Care Settings program "is a Supplemental Nutrition Assistance Program (SNAP) Education program that allows states to receive funding for nutrition education to improve the likelihood that SNAP participants will make healthy food choices."

"The program includes multilevel messaging targeted to preschool children, their parents, and the childcare center staff who shape the policies and practices in their child-care environment."

"Some of the most frequently taught modules used for this intervention included trying new foods (Food Mood); eating a variety of vegetables (Vary Your Veggies); eating a variety of fruits (Flavorful Fruit); incorporating more healthy dairy products into the diet (Dairylicious); eating healthier snacks (Smart Snacking); and engaging in physical activity (Fitness Is Fun)."

Duration:

6 - 10 weeks

Number of contacts:

6 classes for children and parents separately (30-60 minutes per session)

2 classes for centre's staff "Finally, the RDN works with each centre director to identify areas of policy improvement that can enhance nutrition at the centre and teaches at least two classes to the centre's staff to help them integrate the program's messages into their classroom activities"

Setting:

Preschool

Modality:

Multiple (face-to-face, printed materials/resources)

Interventionist:

Registered dietitian nutritionist

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Williams 2014 *(Continued)*

	Integrity: No information provided **Date of study:** March and June 2010 **Description of control:** Wait-list control: "control centers received the intervention after the evaluation was completed, but within the same calendar year."
Outcomes	**Outcome relating to children's fruit and vegetable consumption:** Child's consumption of fruit and vegetables (cups per day) by parent self-report via mail or telephone survey using modified questions from the University of California Cooperative Extension Food and Behaviour Checklist. **Outcome relating to absolute costs/cost effectiveness of interventions:** Not reported **Outcome relating to reported adverse events:** Not reported **Length of follow-up from baseline:** Unclear, ~ 7 to 10 weeks **Length of follow-up post-intervention:** 1 week **Subgroup analyses:** None **Loss to follow-up:** Intervention = 20% Control = 22% **Analysis:** Adjusted for clustering Sample size calculations performed
Notes	First reported outcome (cups of vegetables child consumed at home a day) was extracted for inclusion in the meta-analysis. We selected post-intervention values over change from baseline estimates, and calculated effective sample size at follow-up using an ICC of 0.014 to enable inclusion in meta-analysis. Sensitivity analysis - primary outcome: Primary outcome not stated, power calculation conducted on fruit or vegetable intake

Risk of bias

Bias	Authors' judgement	Support for judgement

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Williams 2014 *(Continued)*

Random sequence generation (selection bias)	Unclear risk	Randomly allocated to experimental group but the random sequence generation procedure is not described
Allocation concealment (selection bias)	Unclear risk	There is no information provided about allocation concealment and therefore it is unclear if allocation was concealed
Blinding of participants and personnel (performance bias) All outcomes	High risk	Child's fruit and vegetable intake (parent survey): There is no blinding to group allocation of participants or personnel described and this is likely to influence performance
Blinding of outcome assessment (detection bias) All outcomes	High risk	Child's fruit and vegetable intake (parent survey): There is no blinding to group allocation of participants or personnel described and because this is a parent-reported survey this is likely to influence detection bias
Incomplete outcome data (attrition bias) All outcomes	High risk	902 (79%) out of 1143 parents completed the follow-up. Given this was a short-term follow-up, the risk of attrition bias is high
Selective reporting (reporting bias)	Unclear risk	There is no study protocol therefore it is unclear if there was selective outcome reporting
Other bias	Unclear risk	At baseline, children in the intervention group were statistically significantly older than children in the control group, but unclear what impact this may have had. "At baseline, children in the intervention group were statistically significantly older than children in the control group (difference=0.2 years; 95% CI 0.1 to 0.3). Otherwise, there were no statistically significant differences in the characteristics of respondents and their households or in outcome measures between the intervention and control groups at baseline". Analyses accounted for clustering

Witt 2012

Methods	**Study design:** Cluster-randomised controlled trial **Funding:** Not reported
Participants	**Description:** Children aged 4 or 5 years at 17 childcare centres **N (Randomised):** 17 childcare centres, 263 children **Age:** "The researchers were not permitted to obtain specific ages of each child but were informed by the centers' directors that the majority of the children were 4 or 5 years old."

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Witt 2012 *(Continued)*

% Female:

47%

SES and ethnicity:

Not specified

Inclusion/exclusion criteria:

Not specified

Recruitment:

Not specified

Recruitment rate:

Unknown

Region:

Boise Idaho (USA)

Interventions	**Number of experimental conditions:** 2 **Number of participants (analysed):** Intervention: fruit = 83, vegetable = 70 Control: fruit = 70, vegetable = 52 **Description of intervention:** "Color Me Healthy comes in a ''toolkit'' that includes a teacher's guide, 4 sets of picture cards, classroom posters, a music CD that contains 7 original songs, a hand stamp, and reproducible parent newsletters. Color Me Healthy is composed of 12 circle-time lessons and 6 imaginary trips. The majority of the CMH circle-time lessons focus on fruits and vegetables of different colors. Several of the lessons provide opportunities for children to try fruits and vegetables. The 6 imaginary trips included in CMH encourage children to use their imagination to explore places, be physically active, and eat fruits and vegetables. Six interactive take home activities were developed for the current evaluation. These interactive activities coincided with the circle-time lessons." **Duration:** 6 weeks **Number of contacts:** 24 (preschool = 2 circle-time + 1 imaginary trip per week, each 15 - 30 minutes, home = 6 interactive take home activities) **Setting:** Preschool + home **Modality:** Face-to-face **Interventionist:** Lead teachers **Integrity:** No information provided

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Witt 2012 *(Continued)*

	Date of study: Unknown **Description of control:** No treatment control: "During the study, comparison classrooms did not incorporate nutrition curriculum into their lesson plans."
Outcomes	**Outcome relating to children's fruit and vegetable consumption:** Child's consumption of fruit and vegetable snacks (grams). "To determine the amount of fruit and vegetable snack consumed, the fruit and vegetable snacks were weighed (in grams) before they were served to children and then weighed again after children had had an opportunity to consume the snack. Percentage of fruit and vegetable snack consumed was calculated for each child." **Outcome relating to absolute costs/cost effectiveness of interventions:** Not reported **Outcome relating to reported adverse events:** Not reported **Length of follow-up from baseline:** 7 weeks (1 week post-intervention) and ~ 5 months (3 months post-intervention) **Length of follow-up post-intervention:** 1 week and 3 months **Subgroup analyses:** None **Loss to follow-up (at 3 months):** Intervention: fruit = 50%, vegetable = 58% Control: fruit = 29%, vegetable = 47% **Analysis:** Adjusted for clustering Unknown sample size calculations performed
Notes	First reported outcome (mean number of pineapple snacks remaining) at the longest follow-up (3 month follow-up) was extracted for inclusion in meta-analysis. Insufficient data available to enable inclusion in meta-analysis (standard deviation not reported, nor available from authors) Sensitivity analysis - primary outcome: Primary outcome not stated, fruit or vegetable intake is only reported outcome.

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Randomly allocated to experimental group but the random sequence generation procedure is not described
Allocation concealment (selection bias)	Unclear risk	There is no information provided about allocation concealment and therefore it is unclear if allocation was concealed

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Witt 2012 *(Continued)*

Blinding of participants and personnel (performance bias) All outcomes	Low risk	Fruit and vegetable snacks (weighed): Objective measure of child's fruit and vegetable intake and unlikely to be influenced by performance bias
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Fruit and vegetable snacks (weighed): Objective measure of child's fruit and vegetable intake and unlikely to be influenced by detection bias
Incomplete outcome data (attrition bias) All outcomes	High risk	Attrition rate > 20% for short-term follow-up. Only 58% of consenting children received fruit snacks at all 3 time points
Selective reporting (reporting bias)	Unclear risk	There is no study protocol therefore it is unclear if there was selective outcome reporting
Other bias	Unclear risk	Recruitment bias: it appears that parents were invited to participate after centres had been randomised, so unclear risk of bias Baseline imbalance: there are no baseline data comparing study groups, so we cannot tell if groups were balanced at baseline, so unclear risk of bias Incorrect analysis: "The current evaluation was a nested design; children were nested within classrooms. The classrooms were the units of assignment, but the outcome data were collected among the children." HLM modelling accounted for clustering, therefore low risk of bias

Wyse 2012

Methods	**Study design:** Cluster-randomised controlled trial **Funding:** *"The trial is funded by the Cancer Institute New South Wales (Ref no. 08/ECF/1-18)."*
Participants	**Description:** Children aged 3 to 5 years attending selected preschools, and their parent **N (Randomised):** 30 preschools, 394 parent-child dyads **Age:** Child (mean): Intervention = 4.3 years, Control = 4.3 years Parent (mean): Intervention = 35.7 years, Control = 35.7 years **% Female:** Child: Intervention = 51%, Control = 46% Parent: Intervention = 95%, Control = 97% **SES and ethnicity:**

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Wyse 2012 *(Continued)*

Household income AUD ≥ 100K: Intervention = 42%, Control = 40%

University education: Intervention = 45%, Control = 50%

Aboriginal and/or Torres Strait Islander: Child: Intervention = 1%, Control = 5%

Parent: Intervention = 1%, Control = 3%

Inclusion/exclusion criteria:

Preschool:

Inclusion criteria: licensed in NSW

Exclusion criteria: "Preschools will be excluded from the trial if they provide meals to children in their care (as this limits parents' capacity to influence the foods their children consume), cater exclusively for children with special needs (given the specialist care required for such children), are Government preschools (as conduct of the research has not been approved by the New South Wales Government Department of Education and Training) or have participated child healthy eating research projects within six months of the commencement of recruitment."

Parent:

Inclusion criteria: "participant must be a parent of a child aged 3 to 5 years attending a participating preschool, must reside with that child for at least four days a week (in order for the child to be sufficiently exposed to the intervention strategies that the parent may implement), must have some responsibility for providing meals and snacks to that child, and must be able to understand spoken and written English."

Exclusion criteria: "Parents will be excluded from the trial if their children have special dietary requirements or allergies that would necessitate specialised tailoring of the intervention or that may be adversely affected by the intervention. Such exclusions will be determined by an Accredited Practising Dietitian who is independent of the research team."

Recruitment:

Preschools randomly selected

"The supervisors of the selected preschools will be sent letters and consent forms informing them of the study and requesting permission to recruit parents through their services."

Recruitment packs will be delivered to each participating preschool

Distribution of these packs to parents will occur *via* methods considered by the preschool supervisor to be most effective and appropriate in engaging parents

Where possible, research staff will attend the preschool, hand out recruitment packs to parents and be available to answer parent questions

Recruitment rate:

Preschool = 51% (30/59)

Region:

New South Wales (Australia)

Interventions	**Number of experimental conditions:** 2 **Number of participants (analysed):** Intervention = 174, Control = 169 **Description of intervention:** The intervention group will receive a resource kit and weekly scripted telephone contacts.

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Wyse 2012 *(Continued)*

"The kit comprises a participant workbook containing information and activities, a pad of meal planners, and a cookbook including recipes high in fruit and vegetables."

"Each telephone contact aims to provide parents with appropriate knowledge and skills to modify three key domains within the home food environment: availability and accessibility of fruit and vegetables; supportive family eating routines, and parental role-modelling."

Duration:

4 weeks

Number of contacts:

4 (one a week)

Setting:

Home

Modality:

Telephone and mailed resources

Interventionist:

Trained telephone interviewers

Integrity:

"During each four-week batch of telephone calls, members of the research team will monitor at least two completed calls made by each interviewer to assess adherence with the intervention protocol."

"In total, 44 intervention calls were monitored, representing 6% of all completed calls and an average of 9 calls per interventionist. Across all monitored calls, interventionists covered 97% of key content areas, and in .80% of calls they "rarely" deviated from the script. In instances in which calls deviated from the script, interventionists were provided with feedback immediately after the call, and the issue was raised during biweekly supervision."

Date of study:

April to December 2010

Description of control:

"Parents allocated to the control group were mailed the Australian Guide to Healthy Eating—a 22-page booklet outlining the dietary guidelines and ways to meet them."

Outcomes

Outcome relating to children's fruit and vegetable consumption:

Child's consumption of fruit and vegetables assessed by parent self-report by telephone survey using items from the Children's Dietary Questionnaire.

Outcome relating to absolute costs/cost effectiveness of interventions:

Not reported

Outcome relating to reported adverse events:

Effect of intervention on family food expenditure

Length of follow-up from baseline:

2 and 6 months

Length of follow-up post-intervention:

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Wyse 2012 *(Continued)*

	1 and 5 months **Subgroup analyses:** None **Loss to follow-up (at 1 and 5 months):** Intervention = 14%, 16% Control = 4%, 9% **Analysis:** Adjusted for clustering Sample size calculations performed
Notes	The fruit and vegetable score outcome at the longest follow-up < 12 months (6 months) was extracted for inclusion in meta-analysis. The reported estimate and 95% CI which adjusted for baseline and clustering were included in meta-analysis Sensitivity analysis - primary outcome: Fruit or vegetable intake listed as primary outcome.

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	The random sequence was generated using a random-number function in Microsoft Excel
Allocation concealment (selection bias)	Unclear risk	There is no information provided about allocation concealment and therefore it is unclear if allocation was concealed
Blinding of participants and personnel (performance bias) All outcomes	High risk	Fruit and vegetable intake (self-reported): Participants were unblinded and this is likely to influence performance
Blinding of outcome assessment (detection bias) All outcomes	High risk	Fruit and vegetable intake (self-reported): Participants were unblinded and because self-reported measure this is likely to influence detection bias
Incomplete outcome data (attrition bias) All outcomes	Low risk	Of 394 parents, 343 (87%) completed the 6-month follow-up. Sensitivity analyses were also conducted where missing follow-up data were imputed by using baseline observation carried forward
Selective reporting (reporting bias)	Low risk	The primary outcomes reported in the outcomes paper align with those specified in the protocol. The 12- and 18-month fruit and vegetable outcomes are reported in Wolfenden 2014
Other bias	Low risk	Contamination, baseline imbalance, & other bias that could threaten the internal validity are unlikely to be an issue. Analyses adjusted for clustering

Zeinstra 2017

Methods	**Study design:**

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Zeinstra 2017 *(Continued)*

	Cluster-randomised controlled trial **Funding:** *"The research leading to these results has received funding from the European Community's Seventh Framework Programme (FP7/2007-2013) under the grant agreement n_FP7-245012- HabEat."*
Participants	**Description:** Children aged 4-6 years attending a primary school in Arnhem, the Netherlands **N (Randomised):** 102 children **Age:** Child (mean): overall = 4.8 years (not reported by group) **% Female:** Child: overall = 51% (not reported by group) **SES and ethnicity:** Maternal education: high = 56%, medium = 34%, low = 10% Paternal education: high = 55%, medium = 35%, low = 10% **Inclusion/exclusion criteria:** Inclusion/exclusion criteria no explicitly stated, *"Healthy children without any allergies for the foods used in the study were allowed to participate."* **Recruitment:** *"All parents received an information booklet to inform them about the aim and the study procedures."* **Recruitment rate:** 91% (102/112) **Region:** Amhem (the Netherlands)
Interventions	**Number of experimental conditions:** 3 **Number of participants (analysed):** Convivial eating (CE) = 39, positive restriction (PR) and CE = 41, control = 19 **Description of intervention:** CE: *"A video film was created specifically for this study with the help of two Dutch children's TV idols (adults), called Ernst and Bobbie (http://www.ernstbobbie.nl/). In the 4-min video, they are enthusiastic about vegetables in general, and about carrots in particular. While they eat carrots enthusiastically, the story illustrates that carrots will make you strong and superfast. The film includes a catchy song about vegetables"* PR + CE: *"Children in the PR + CE condition were first exposed to five sessions of positive restriction, in which the children watched the role modelling video film while they did not receive carrots themselves. After this PR period, the PR + CE children participated also in eight convivial eating sessions: eating raw carrots while watching the role modelling video"* **Duration:**

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Zeinstra 2017 *(Continued)*

CE and control = 4 weeks, PR + CE = 5 weeks

Number of contacts:

CE: 8 (twice/week), PR + CE: 13 (8 CE sessions + 5 PR sessions)

Setting:

Primary school

Modality:

Video

Interventionist:

Teacher

Integrity:

"Children from both intervention conditions (CE and PR + CE) attended on average 7.8 ± 0.6 of the eight convivial eating sessions, ensuring sufficient presence to be included in the dataset."

Date of study:

Unknown

Description of control:

"The control group ate raw carrots twice without watching the role modelling video."

Outcomes

Outcome relating to children's fruit and vegetable consumption:

Child's consumption of carrots (grams). *"Intake was calculated by subtracting the leftover weight from the weight before consumption, using a Kern & Sohn EMB600-1 weigh- ing scales, with a precision of 0.1 g."*

Outcome relating to absolute costs/cost-effectiveness of interventions:

Not reported

Outcome relating to reported adverse events:

Not reported

Length of follow-up from baseline:

9 months

Length of follow-up post-intervention:

~7 months

Subgroup analyses:

"For the individual analyses, children were assigned into two groups: carrot eaters and carrot non-eaters."

Loss to follow-up (at ~7 months)

Overall = 3% (not reported by group)

Analysis:

Unknown if adjusted for clustering

Sample size calculation performed

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Zeinstra 2017 *(Continued)*

Notes

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Assignment was described as random on condition that school classes that could see each other physically (through large windows between classrooms) were in the same experimental condition.
Allocation concealment (selection bias)	Unclear risk	Appears allocation was based on whether the classes could see each other physically
Blinding of participants and personnel (performance bias) All outcomes	Low risk	Objective measure of child's vegetable intake and unlikely to be influenced by performance bias
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Vegetable intake weighed in grams and so the risk of detection bias is low.
Incomplete outcome data (attrition bias) All outcomes	Low risk	93/99 (94%) children completed the 9-month follow-up assessment, no ITT and so the risk of attrition bias is low.
Selective reporting (reporting bias)	Unclear risk	There is no study protocol therefore it is unclear if there was selective outcome reporting.
Other bias	Low risk	Recruitment bias (low risk): participants were recruited prior to randomisation Baseline imbalance (low risk): there were no significant differences between the 3 conditions or between the 5 school classes. Loss of clusters (low risk): no evidence of loss of clusters. Incorrect analysis (low risk): there is no mention that clustering has been adjusted for in the analysis. The review authors adjusted for in the meta-analysis. Contamination bias (low risk): randomised so children in control could not see intervention classroom, low risk of contamination

Zeinstra 2018

Methods	**Study design:** Cluster-randomised controlled trial **Funding:** *"This project received financial support from the Fresh Produce Centre and the Ministry of Economic Affairs (grant number TU 1310-086). Neither organization had any role in the design, analyses, or writing of this article."*
Participants	**Description:** Infants aged 0-4 years in 4 childcare centres in Utrecht, Netherlands

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Zeinstra 2018 *(Continued)*

N (Randomised):

4 childcare centres

Age:

Mean: intervention = 25.6 months, control = 25.0 months

% Female:

Intervention = 44%, control = 42%

SES and ethnicity:

Parent education level* - intervention: low (0%), middle (5%), high (95%), control: low (0%), middle (10%), high (90%)

*low = primary and/or secondary school, middle = vocational education, high = higher vocational education and/or university degree

Inclusion/exclusion criteria:

"Healthy children without any allergies to the study products could participate."

Recruitment:

Recruited via 4 childcare centres in Utrecht, Netherlands "Information packs were distributed to 526 parents to inform them about the study aims and procedures."

Recruitment rate:

Unknown

Region:

The Netherlands

Interventions

Number of experimental conditions: 2

Number of participants (analysed):

Intervention (2 centres): 101 children

Control (2 centres): 91 children

Description of intervention:

"To prevent boredom and encourage tasting, each vegetable was presented in two different preparations: pumpkin blanched and as a cracker spread; courgette blanched and as soup; white radish raw and as a cracker spread."

"The study vegetables were offered during the habitual vegetable snack moment in the afternoon, between 15h00 and16h00."

"A vegetable song - developed specifically for this study was played to make the vegetable eating occasion recognizable and fun for the children."

Duration:

21 weeks

Number of contacts:

Unclear, 21 weeks "was chosen to ensure that each child was exposed to each vegetable at least 10 times"

Setting:

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Zeinstra 2018 *(Continued)*

	Preschool **Modality:** Face-to-face **Interventionist:** Childcare employees **Integrity:** "Intervention children received on average six exposures to each vegetable product" **Date of study:** Unknown **Description of control:** "The control group kept their regular eating routines during this period."
Outcomes	**Outcome relating to children's fruit and vegetable consumption:** Consumption of vegetables (grams) as desired, assessed by weighing the vegetable cups before and after consumption. "Vegetable intake was calculated by subtracting the leftovers from the pre-weight." **Outcome relating to absolute costs/cost-effectiveness of interventions:** Not reported **Outcome relating to reported adverse events:** Not reported **Length of follow-up from baseline:** 21 weeks **Length of follow-up post-intervention:** 4 weeks **Subgroup analyses:** None **Loss to follow-up:** Unclear **Analysis:** Unclear if adjusted for clustering Sample size calculations performed
Notes	We extracted first reported outcome (mean g of pumpkin intake) for inclusion in meta-analysis. We estimated mean and SD from a study figure using an online resource (Plot Digitizer: plotdigitizer.sourceforge.net) for intervention and control groups at post-test. As an estimate at that adjusted for clustering was not reported, we used post-intervention data and calculated an effective sample size using ICC of 0.014 to enable inclusion in meta-analysis.

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Zeinstra 2018 *(Continued)*

Sensitivity analysis - primary outcome: primary outcome not stated, sample size was based on vegetable intake outcome.

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	"Two childcare centres were randomly assigned to the intervention condition" Randomly allocated to experimental group but the random sequence generation procedure is not described.
Allocation concealment (selection bias)	Unclear risk	There is no information provided about allocation concealment and therefore it is unclear if allocation was concealed.
Blinding of participants and personnel (performance bias) All outcomes	Low risk	Parents and child care staff were blinded to the aims of the study. The likelihood of performance bias in relation to vegetable consumption is low, given the children's age.
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Research assistants present to observe process of weighing food and eating – however this seems unlikely to impact child consumption. Vegetable cups were weighed before and after consumption and therefore low risk of detection bias.
Incomplete outcome data (attrition bias) All outcomes	High risk	Attrition rate > 20% (see Table 3)
Selective reporting (reporting bias)	Unclear risk	Trial protocol is not available
Other bias	Unclear risk	There may be potential recruitment bias as intervention and control parents were told different aims of the study (pg 318), which meant that researchers were aware of study group allocation before recruiting parents to study.

BMI: body mass index; **EA:** exposure alone; **EP:** exposure plus praise; **ETR:** exposure plus tangible non-food reward; **DOB:** date of birth; **FV:** fruit and vegetables; **ICC:** intra-class correlation;**ITT:** intention-to-treat; **N/A:** not applicable;**PA:** physical activity; **SD:** standard deviation; **SEM:** standard error of the mean; **SES:** socioeconomic status

Characteristics of excluded studies *[ordered by study ID]*

Study	Reason for exclusion
Aass 2018	Child mean age 5.4 years
Aboud 2008	This responsive feeding trial was ineligible as its primary outcome was not to increase fruit and vegetable consumption and the study only assessed children's fruit and vegetable consumption post-hoc in order to describe the mechanism behind a change in weight status among participants in the sample
Adams 2011	No fruit or vegetable intake outcome
Adams 2019	Participants were aged 8-16 years, as per trial registry
Agrawal 2012	No fruit or vegetable intake outcome

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Study	Reason for exclusion
Ahearn 2001	Not RCT
Ahern 2014	Not RCT
Ajie 2016	Study design: not RCT
Aktac 2019	Not RCT: quasi-experimental
Al Bashabsheh 2016	No fruit or vegetable intake outcome
Alcazar 2017	Not RCT
Alford 1971	Children aged 6-17 years
Amin 2016	Participants were grade 3-5 children
Amsel 2019	Primary outcome is change in BMI z-score for preschoolers
Anderson 2014	Mean age of children 5.3 years
Anez 2013	Participant mean age 5.01 years
Ang 2016	Participants were 2nd and 3rd grade children
Anliker 1993	Children aged 14-17 years
Anonymous 2001	Not RCT: editorial
Anonymous 2002	Not RCT: editorial
Anonymous 2007	Not RCT: editorial
Anonymous 2009	Not RCT: editorial
Anonymous 2011a	Not RCT: editorial
Anonymous 2011b	Children aged 5-9 years
Anonymous 2012	Participants were 4th grade children
Anonymous 2019a	Not RCT: editorial
Anonymous 2019b	Participants were aged 8-16 years, as per trial registry
Anstrom 2017	Not RCT
Anton-Păduraru	Not RCT
Anzman-Frasca 2018	Child mean age 6.6 years
Apatu 2016	Participants were adult, no participants aged 0-5 years
Aranceta-Bartrina 2016	Not RCT
Arlinghaus 2018	Not RCT

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Study	Reason for exclusion
Arredondo 2018	Participants were mothers with children aged 7-13 years
Arrow 2013	Primary outcome was not fruit or vegetable intake; primary outcome was dental caries incidence and prevalence of obesity
Askelson 2017	Participants were 3rd grade children
Au 2015a	No fruit or vegetable intake outcome, only assessed intake of fruit juice
Au 2015b	No fruit or vegetable intake outcome
Au 2016	Mean age of participants was 9.8 years
Au 2019	Not RCT
Azevedo 2019	Not RCT: quasi-experimental
Bai 2012	Participants were elementary school children
Bakke 2018	Not RCT
Bannon 2006	Outcome is food choice (apple or crackers)
Bante 2008	Not RCT
Baranowski 2002	Children aged 9-18 years
Barkin 2012	Primary outcome was not fruit or vegetable intake; primary outcome was weight and BMI
Baxter 1998	Not RCT: editorial
Bayer 2009	Child mean age 6 years
Bean 2018	Not RCT: quasi-experimental
Beasley 2012	Children aged 8-12 years
Beets 2016	Participants were aged 6-12 years
Beinert 2017	No fruit and vegetable consumption data, related to ongoing trial registration ISRCTN45864056
Bellows 2013	Intervention was not designed to increase fruit and/or vegetable consumption, intervention aimed to explore individual, family and environmental factors and their relationship to child weight status
Bellows 2017	Not RCT
Benjamin 2008	Outcome is quality of meals
Benjamin Neelon 2016	No fruit or vegetable intake outcome, only amount served
Bensley 2011	Quasi-experiemental design
Bere 2015	Participants were 6th and 7th grade children
Berg 2016	Not RCT: book review

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Study	Reason for exclusion
Bergman 2016	Participants were 3rd, 4th and 5th grade children
Berhe 1997	No comparison group
Bernal 2019	Not RCT
Berry 2013	No fruit or vegetable intake outcome
Bessems 2012	Children aged 12-14 years
Best 2016	Children aged 7-12 years
Bhandari 2004	Intervention not targeting increase in fruits and vegetables
Bibiloni 2017	Study design: allocation to conditions not random
Birch 1980	Not randomised
Birch 1982	No control group
Birch 1998	Not RCT
Black 2013	Child mean age of subgroups ranged from 5.8-11 years
Blissett 2012	No comparison group
Blom-Hoffman 2008	Child mean age 6.2 years
Boaz 1998	Children aged 7-9 years
Bocca 2018	Primary outcome BMI
Bollella 1999	Outcome is vitamins and minerals, not fruit and vegetable consumption
Bonvecchio-Arenas 2010	Participants were primary school children
Borys 2016	Participants were aged 6-8 years
Bouhlal 2014	Allocation of groups to condition was not randomised
Bradley 2014	No fruit or vegetable intake outcome, outcome is preference
Brambilla 2010	No fruit and vegetable consumption outcome
Branscum 2013	Children aged 8-11 years
Briefel 2006	No comparison group
Briefel 2009	Children aged 6-18 years
Briefel 2010	No comparison group
Briefel 2018	Primary outcome of trial is "Very low food security among children according to the U.S. Household Food Security Survey Module"

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Study	Reason for exclusion
Briley 1999	No comparison group
Briley 2011	Not RCT: editorial
Briley 2016	Primary outcome was not fruit or vegetable intake; primary outcome was observed servings in packed lunch
Britt-Rankin 2016	Not RCT: review of resource
Brotman 2012	No fruit and vegetable consumption outcome
Bruening 1999	Non-equivalent control group design
Brunt 2012	Participants were 4th grade school children
Bryant 2017	Primary outcome not fruit and vegetable consumption, primary outcomes was parent engagement
Burgermaster 2017	Participants were 5th grade students
Buscail 2018	Child mean age 7.5 years
Buttriss 2004	Not RCT: descriptive review
Byrd-Bredbenner 2012	Primary outcome was not fruit or vegetable intake; primary outcome was BMI and audits of home environment characteristics/lifestyle practice
Byrne 2002	Outcome was willingness to taste kohlrabi
Calancie 2018	Not RCT
Camelo 2016	Participants were children aged 6-13 years
Campbell 2016a	Primary outcome was not fruit or vegetable intake; primary outcome was body weight and waist circumference
Campbell 2016b	Primary outcomes were length for age score and rates of stunting
Campbell 2017	No fruit and vegetable consumption outcome reported
Candido 2013	No fruit or vegetable intake outcome
Capaldi-Phillips 2014	Allocation of groups to condition was not randomised
Carstairs 2018	Not randomised
Carter 2005	Children aged 9-12 years
Carter 2018	Not RCT: uses baseline data only
Cason 2001	No comparison group
Cassey 2016	Participants aged 14-19 years
Castro 2013	Child mean age 6 years

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Study	Reason for exclusion
Cates 2014	Not RCT
Caton 2014	Study design: results are not reported by study group. Additionally the paper reports data from 3 other included trials: Caton 2013; Hausner 2012; Remy 2013
Chatham 2016	Participants mean age 6.15 years
Chen 2015	Participants were aged 5-8 years old
Chen 2019	Participants were 4th and 5th grade school children
Choi 2018	Not RCT
Chow 2016	No fruit and vegetable consumption outcome reported, related to ongoing study Belanger 2016
Chung 2018	Participants were aged 7-10 years old
Ciampolini 1991	No comparison group
Clason 2016	No fruit or vegetable intake outcome, only number of days per week child consumes
Coelho 2012	Children aged 8-12 years
Cohen 2014	Child mean age 8.6 years
Cohen 2018	Child mean age 13.3 years
Coleman 2005	No fruit and vegetable outcomes
Collins 2011	Child mean age 8 years
Condrasky 2006	Quasi-experimental: intervention sample randomly selected from 1 church. Control randomly selected from a separate church
Cooper 2011	Children aged 5-11 years
Cooperberg 2014	No fruit or vegetable intake outcome
Copeland 2010	Child mean age 9 years
Coppinger 2016	Children aged 5-11 years
Corsini 2013	Participants were children with mean age 5.16 years
Cotwright 2017a	No comparison group: pretest-post-test design
Cotwright 2017b	Primary outcome willingness to try fruits and vegetables
Coulthard 2018	No fruit and vegetable consumption outcome
Court 1977	No participants, these are guidelines, not research trial
Crespo 2012	Child mean age 5.9 years
Croker 2012	Child mean age 8.3 years

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Study	Reason for exclusion
Cruz 2014	As per trial registry, fruit and vegetable consumption was not the primary outcome
Cullen 2013	Participants were kindergarten-grade 5 and grade 6-8 children
Cullen 2015	Participants were kindergarten-grade 5
Curtis 2012	No child fruit or vegetable intake outcome
Céspedes 2012	Primary outcome was not fruit or vegetable intake; primary outcome was knowledge, attitudes and physical activity habits
Dai 2015	Child mean age 6 years
Dalton 2011	No child fruit or vegetable intake outcome
Daniels 2012	Related to Daniels 2014, no fruit and vegetable consumption outcome
Dannefer 2017	Not RCT
Davoli 2013	Primary outcome was not fruit or vegetable intake; primary outcome was BMI
Day 2008	Child mean age 9-10 years
Dazeley 2015	No fruit or vegetable intake outcome, only assessed foods touched and tasted
De Bourdeaudhuij 2015	Child mean age in intervention group 6.05 year and in control group 5.98 years
De Droog 2011	No fruit or vegetable intake outcome, only assessed liking and purchase request intent
De Droog 2012	No fruit and vegetable consumption outcome
de la Haye 2019	Primary outcomes relate to mothers
De Pee 1998	No comparison group
De Silva-Sanigorski 2010	Quasi-experimental, repeat cross-sectional design
Delgado 2014	Intervention was not designed to increase fruit and/or vegetable consumption
Dev 2018	Not RCT
Dick 2016	Not RCT: editorial
Dollahite 2014	No child fruit or vegetable intake outcome
Dorado 2015	Children aged 9-10 years
Draper 2010	Participants were 4, 5 and 6 grade children
Duke 2011	Not RCT: descriptive review
Dumas 2017	Primary outcome is mothers intake
Duncanson 2017	Related to Duncanson 2013, does not report RCT results

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Study	Reason for exclusion
Dunn 2004	No fruit and vegetable consumption outcome
Early 2019	Quasi-experimental
Eicholzer-Helbling 1986	Outcome no consumption measure
Elder 2014	Child mean age 6.6 years
Elizondo-Montemayor 2014	Children aged 6-12 years
Epstein 2001	Children aged 6-11 years
Esfarjani 2013	Children aged 7 years
Esquivel 2016	Not RCT
Estabrooks 2009	Children aged 8-12 years
Evans 2005	Children in 4th, 5th grade school
Evans 2011	No child fruit or vegetable intake outcome
Evans 2016	Participants were 3rd grade children
Evenson 2016	No fruit and vegetable consumption outcome
Faber 2002	Cross-sectional survey
Faith 2006	The intervention programme was not specifically designed to increase consumption of fruit and vegetables; instead primary aim is to illustrate a methodological concept. “This methodological note illustrates the use of co-twin design for testing substitution, phenomenon, a prominent behavioural economics concept. We test whether fruits and vegetables can substitute for high-fat snack foods in young children in a single meal laboratory setting.”
Fangupo 2015	Primary outcome as reported in trial registry was not fruit or vegetable intake
Fernandes 2011	Not RCT: measurement tool
Fernando 2018	No infant fruit or vegetable intake outcome
Fernández-Alvira 2013	Child mean age 11 years
Ferrante 2018	Not RCT
Ferrante 2019	Not RCT
Ferreira 2019	Primary outcome breastfeeding as reported in trial registry
Fialkowski 2013	Intervention was not designed to increase fruit and/or vegetable consumption
Fisher 2007	No fruit and vegetable consumption outcome
Fisher 2013	No fruit and vegetable consumption outcome
Fisher 2014	No child fruit or vegetable intake outcome

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Study	Reason for exclusion
Fishman 2016	Not RCT: editorial
Fitzgibbon 2002	Outcome is weight change
Fitzpatrick 1997	Not RCT
Fletcher 2009	Children aged 13-19 years
Foerster 1998	Children in 4th, 5th grade school
Folta 2006	Children in grades 1-3 school
Fournet 2014	Children aged 6-13 years
Freedman 2010	Outcome is child feeding attitudes and practices
French 2012	Intervention was not designed to increase fruit and/or vegetable consumption
Frenn 2013	Participants were 5th, 7th and 8th grade students
Friedl 2014	Not RCT: task force report
Friend 2015a	Participants were parents of 8-12 year-old children
Friend 2015b	No fruit and vegetable consumption outcome reported
Gaglianone 2006	Participants were 1st and 2nd grade children
Galdamez 2017	Not RCT
Gallo 2017	Participants were aged 6-11 years
Gallotta 2016	Children aged 8-11 years
Garcia-Lascurain 2006	Participants were aged 9-12 years
Gardiner 2017	Participants were at least 18 years of age
Gaughan 2016	No comparison group
Gelli 2016	Child mean age 7.5 years
Gelli 2018	No child fruit or vegetable intake outcome
Gentile 2009	Children in 3rd, 4th, 5th grade school
Gittelsohn 2010	Children aged 8-12 years
Glanz 2012	No child fruit or vegetable intake outcome
Glasper 2011	Not RCT: editorial
Glasson 2012	Participants were parents of primary school-aged children
Glasson 2013	Not RCT

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Study	Reason for exclusion
Golley 2012	Child mean age 8.3 years
Gomes 2018	Not RCT: quasi-experimental
Goncalves 2018	Child mean age > 6 years
Gorham 2015	No comparison group
Gosliner 2010	Quasi-experimental: childcare centres in existing study matched to other childcare centres, then randomised
Goto 2012	No child fruit or vegetable intake outcome
Gottesman 2003	No participants, not research trial
Graham 2008	Outcome not fruit and vegetable consumption
Granleese 2019	Not RCT
Gratton 2007	Children aged 11-16 years
Gregori 2014	No comparison group
Gripshover 2013	Intervention was not designed to increase fruit and/or vegetable consumption
Gross 2012	Primary outcome was not fruit or vegetable intake; primary outcome was obesity
Grupo de Diarios América 2019a	Not RCT: editorial
Grupo de Diarios América 2019b	Not RCT: editorial
Grupo de Diarios América 2019c	Not RCT: editorial
Gucciardi 2019	Not RCT
Guenther 2014	No participants aged 0-5 years
Guilfoyle 2019	Not RCT
Guldan 2000	Not RCT
Guo 2015	Participants were 3rd to 5th grade students
Haines 2016	No child fruit or vegetable intake outcome
Haines 2018	Primary outcome is BMI
Hambleton 2004	Children aged 9-10 years
Hammersley 2017	Primary outcome not fruit and vegetable intake, primary outcome is BMI
Hammons 2013	Children aged 5-13 years

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Study	Reason for exclusion
Hancocks 2011	Not RCT: editorial
Hanks 2016	No fruit and vegetable consumption outcome
Hannon 2017	No child fruit or vegetable consumption outcome
Hansen 2016	Participants were children aged 6-14 years
Hanson 2017	Not a randomised study design
Hardy 2010a	No fruit or vegetable intake outcome, only assessed lunchbox contents
Hardy 2010b	No child fruit or vegetable intake outcome
Hare 2012	Child mean age 6.3 years
Haroun 2011	Participants were primary school children: aged 4-12 years old
Harris 2011	Children aged 5-12 years
Hart 2016	No child fruit or vegetable intake outcome
Harvey-Berino 2003	No fruit and vegetable consumption outcome
Havas 1997	No assessments of children included in study
Havermans 2007	Participants had mean age of 5.2 years
Heath 2010	No fruit and vegetable consumption outcome
Heim 2009	Children in 4th and 6th grade school
Helland 2013	Primary outcome was not fruit or vegetable intake; primary outcome was food neophobia and staff feeding practices
Helland 2016	Primary outcome was not fruit or vegetable intake; primary outcome was food neophobia and staff feeding practices
Helland 2017	No comparison group
Helle 2019	No fruit and vegetable consumption outcome, related to ongoing study Helle 2017
Hendy 2002	No comparison group
Hendy 2011	Participants were 1st, 2nd and 4th grade children
Herbold 2001	Participants were 1st and 6th grade children
Herring 2016	Not RCT: editorial
Hildebrand 2010	No comparison group
Hoddinott 2017	Primary outcome not fruit and vegetable intake as per trial registry
Hoffman 2011	Child mean age 6.2 years

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Study	Reason for exclusion
Hohman 2017	Fruit and vegetable intake not primary outcome as per trial registry BMI is primary outcome
Hollar 2013	Participants were kindergarten 5th grade children
Holley 2015	Not RCT: allocation was not randomised
Hooft 2013	No child fruit or vegetable intake outcome
Horne 2009	Child mean age 7 years
Horodynski 2004	Non-equivalent control group study design
Hotz 2012a	Intervention was not designed to increase fruit and/or vegetable consumption, intervention aimed to increase the consumption of orange sweet potato over consumption of white and yellow sweet potato
Hotz 2012b	Intervention was not designed to increase fruit and/or vegetable consumption, intervention aimed to increase the consumption of orange sweet potato over consumption of white and yellow sweet potato
Howarth 2011	No comparison group
Hu 2010	Outcome was eating behaviours and weight, not fruit and vegetables
Hughes 2007	Outcome was feeding styles and behaviour
Hughes 2016b	No fruit and vegetable consumption outcome
Hull 2017	No fruit and vegetable consumption outcome, related to awaiting classification Hull 2014
Iaia 2017	Fruit and vegetable intake not primary outcome, primary outcome combined health behaviour score
IFIC 2002	Children aged 9-12 years
Israelashvili 2005	No fruit and vegetable consumption outcome
Issanchou 2017	Not RCT
Izumi 2013	No child fruit or vegetable intake outcome
James 1992	No comparison group
Jancey 2014	No child fruit or vegetable intake outcome
Janicke 2013	Primary outcome was not fruit or vegetable intake; primary outcome was BMI
Jannat 2019	Primary outcome length for age z-score and diarrhoea prevalence
Jansen 2010	Participants were children with mean age 5.8 years
Jansen 2017	Fruit and vegetable intake not primary outcome
Jayne 2008	Outcome was food choice

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Study	Reason for exclusion
Jiménez-Aguilar 2019	Not RCT
Johansson 2019	Primary outcome was body composition, as reported by trial registration
Johnson 1993	Fruit and vegetable consumption was measured in terms of dietitian-classified 'appropriate' versus 'inappropriate' consumption levels, and as such, it failed to meet the inclusion criteria relating to the primary outcome
Johnson 2007	Outcome is food preference and ranking
Jordan 2010	No child fruit or vegetable intake outcome
Joseph 2015a	No child fruit or vegetable intake outcome
Joseph 2015b	No comparison group
Jung 2018	Not RCT
Just 2013	Participants were elementary school children
Kabahenda 2011	No child fruit or vegetable intake outcome
Kain 2012	Participants aged 6-12 years
Kalb 2005	No participants, not research trial
Kang 2017	Fruit and vegetable intake not primary outcome
Kannan 2016	Not RCT
Karanja 2012	Primary outcome was not fruit or vegetable intake; primary outcome was BMI
Karpyn 2017	Child mean age 8.55 years
Kashani 1991	Child mean age 10 years
Kaufman-Shriqui 2016	Participants mean age 5.28 years
Kelder 1995	Children in 6th grade school
Keller 2014	Not RCT: editorial
Kennedy 2011	Participants were adults
Kessler 2016	Not RCT: review
Khoshnevisan 2004	Dietary outcomes not reported for the control group and no comparison made between experimental conditions
Kidala 2000	Quasi-experimental: 2 areas, 1 intervention, 1 control, not randomly selected
Kilaru 2005	Outcome is proportion being fed bananas
Kilicarslan 2010	Child mean age 9.3 years

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Study	Reason for exclusion
Kim 2019a	Child mean age 5.1 years
Kimani-Murage 2013	Primary outcome was exclusive breastfeeding
Kipping 2014	Participants aged 8-9 years
Kipping 2016	Primary outcome was not fruit or vegetable intake
Knoblock-Hahn 2016	No fruit and vegetable consumption outcome
Knowlden 2015	Child mean age 5.18 years
Ko Linda 2016	No participants aged < 5
Koehler 2007	No fruit and vegetable consumption outcome
Koff 2011	No comparison group
Kolodinsky 2017	No fruit and vegetable intake outcome data reported: related to ongoing study Seguin 2017
Korwanich 2008	Quasi-experimental: 8 intervention schools; 8 matched control schools
Kotler 2012	No fruit or vegetable intake outcome, only number of pieces of food consumed
Kotz 2010	Not RCT: editorial
Kral 2010	Participants were children with mean age 5.9 years
Krane 2017	Not RCT
Lambrinou 2019	Primary outcome is BMI
Lanigan 2010	Not RCT: review
Laramy 2017	No comparison group
LaRowe 2010	No comparison group
Larson 2011	No child fruit or vegetable intake outcome
Laureati 2014	Child mean age 7.9 years
Leahy 2008a	No fruit and vegetable outcome
Leahy 2008b	No fruit and vegetable consumption outcome
Leahy 2008c	Fruit and vegetable consumption was secondary outcome
Ledoux 2017	No comparison group, pretest-post-test design
Lee 2017	Not RCT, related to ongoing study Lee 2018a
Lee 2018b	Child mean age 7.7 years
Leme 2015	Participants were adolescents

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Study	Reason for exclusion
Leonard 2019	Not RCT
Lin 2017	No fruit and vegetable outcome
Ling 2016a	No child fruit or vegetable intake outcome
Ling 2016b	Not RCT
Lioret 2015	Related to Campbell 2013, does not report fruit and vegetable RCT results
Llargues 2011	Child mean age 6 years
Lloyd 2011	Participants were fathers of children aged 5-12 years
Locard 1987	No comparison group
Lohse 2017	Not RCT, editorial
Longacre 2015	No child fruit or vegetable intake outcome
Longley 2013	Not RCT: editorial
Loth 2017	Participants aged 8-12 years
Low 2007	Quasi-experimental, 2 intervention areas, and 1 control area selected, in prospective longitudinal study
Luepker 1996	Child mean age 8.8 years
Lumeng 2012	Intervention was not designed to increase fruit and/or vegetable consumption, intervention aimed to improve children's emotional and behavioural self regulation on preventing obesity
Madden 2018	Not RCT
Maier 2007	Not RCT: treatment group not randomised
Maier 2008	Not RCT
Maier-Noth 2016	Not RCT
Maier-Noth 2017	Not RCT
Malden 2018	Primary outcomes: BMI z-score, nursery and home physical activity, nursery and home sedentary behaviour
Malekafzali 2000	No fruit and vegetable consumption data
Mallan 2017	Related to Daniels 2014: only reports data from the control group
Manger 2012	Child mean age 5.7 years
Manios 1999	Not RCT
Manios 2009	No comparison group

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Study	Reason for exclusion
Manios 2018	Primary outcome BMI, as reported in trial registration
Mann 2015	No outcome data: related to ongoing study Østbye 2015
Mann 2017	Not RCT: resource review
Mann 2018	Not RCT
Marcano-Olivier 2019	Participants were grade 1-6 children
Markert 2014	Child mean age 9 years
Marquard 2011	No child fruit or vegetable intake outcome
Martens 2008	Children aged 12-14 years
Mathias 2012	Participants were children with mean age 5.4 years
Mbogori 2016	No comparison group
McGowan 2013	Primary outcome was not fruit or vegetable intake; primary outcome was parental habit strength
McKenzie 1996	Child mean age 6.3-6.8 years
McSweeney 2017	Fruit and vegetables not primary outcome, primary outcomes were related to feasibility
Mehta 2014	No comparison group
Meinen 2012	Child mean age 9.9 years
Melnick 2018	Not RCT
Mennella 2017	No fruit and vegetable consumption outcome
Merida 2019	Quasi-experimental
Metcalfe 2016	Participants were children aged 8-13 years
Metcalfe 2017	Participants aged 8-14 years
Mok 2017	Fruit and vegetables not primary outcome, primary outcome Vitamin D plasma concentrations
Molitor 2016	No comparison group: cross-sectional study
Monterrosa 2013	Not RCT: quasi-experimental
Morgan 2016	Not RCT
Morgan 2017	Participants were aged 5-12 years old
Morison 2018	Primary outcome BMI
Morrill 2016	Participants were grade 1-5 students
Morshed 2018	No child fruit or vegetable intake outcome

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Study	Reason for exclusion
Mozer 2019	Not RCT
Murimi 2017	No fruit and vegetable outcome
Nabors 2015	Participants mean age 6.12 years
Nansel 2016	Participants aged 8.0-16.9 years
Nansel 2017	Participants in the CHEF trial were ages 8-16 years
NAPNAP 2006	Guidelines not trial, so no participants
Natale 2014b	Primary outcome was not fruit or vegetable intake as per trial registry
Nederkoorn 2018	Mean age of participants 5.85 years
Nemet 2007	Child mean age 5.5 years
Nemet 2008	Children aged 8-11 years
Nemet 2011	No fruit and vegetable consumption outcome
Nerud 2017	No fruit and vegetable intake outcome
Nguyen 2017	Participants were 4th and 5th grade children
Nicklas 2011	Not fruit and vegetable intake outcome reported, only preference.
Niederer 2011	Child mean age 5.2 years
Noller 2006	No child fruit or vegetable intake outcome
Novotny 2011	Not RCT
Nunes 2017	Primary outcome is frequency of exclusive and total breastfeeding as per trial registry
Nystrom 2017	Fruit and vegetable not primary outcome, primary outcome was BMI
O'Connor 2010	No comparison group
O'Sullivan 2017	Fruit and vegetable not primary outcome: primary outcomes relate to school readiness, physical health etc
Ogle 2016	Participants aged 6-9 years
Ojeda-Rodriguez 2018	Children were aged 7-16 years
Olsen 2019	Study design: no random allocation of intervention
Olvera 2010	Children aged 7-13 years
Onnerfält 2012	Primary outcome was not fruit or vegetable intake; primary outcome was BMI
Overcash 2017	Children were aged 9-12 years

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Study	Reason for exclusion
Paineau 2010	Participants were children in 2nd and 3rd grade
Panunzio 2007	Children in 4th grade school
Parcel 1989	Children in 3rd, 4th grade school
Parekh 2018	Study design: combined all baseline data before randomisation
Park 2018	Not RCT
Passehl 2004	Outcome is process evaluation
Peracchio 2016	No fruit and vegetable consumption outcome
Perry 1985	Children in 3rd, 4th grade school
Persky 2018	Child mean age across treatment groups 5.26-5.51 years
Persson 2018	Primary outcomes are children's BMI and waist circumference at 4 years
Peters 2012a	No child fruit or vegetable intake outcome
Poelman 2016b	The average age was 5.1 years (SD 0.8, range 4-6.8 years)
Polacsek 2017	No fruit and vegetable consumption outcome
Potter 2019	Not RCT
Prelip 2011	Participants were 3rd-5th grade children
Presti 2015	Participants aged 5-11 years
Price 2015	Children were aged 6-12 years
Prosper 2009	Child mean age 11.7 years
Puia 2017	Participants aged 5-15 years
Quandt 2013	No child fruit or vegetable intake outcome
Quizan-Plata 2012	Participants were primary school children
Rackliffe 2016	Not RCT: resource review
Rahman 1994	Outcome asks if vegetables eaten today (yes/no). No amount provided
Raine 2018	Not RCT: editorial
Rangelov 2018	Child mean age 8.5 years
Ransley 2007	Non-RCT. 1 intervention sample and 1 matched control sample
Ray 2019	Not RCT
Raynor 2012	Child mean age 6.7 years

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Study	Reason for exclusion
Reicks 2012	Children aged 9-12 years
Reifsnider 2012	No child fruit or vegetable intake outcome
Reinaerts 2007	Quasi-experimental: consenting schools paired then randomised to 1 of 2 interventions. Control schools in different area identified and then matched
Reinbott 2016	Primary aim (as per trial registry) is mean height for age z-scores
Reinehr 2011	Primary outcome was not fruit or vegetable intake, primary outcome was weight
Reverdy 2008	Children aged 8-10 years
Reynolds 1998	Participants were 4th grade children
Reznar 2013	No fruit or vegetable intake outcome, only assessed diet quality
Ribeiro 2014	Children aged 6-11 years
Ridberg 2019	Not RCT
Riggsbee 2018	Quasi-experimental
Rioux 2018	No fruit and vegetable intake outcome
Ritchie 2010	Children aged 9-10 years
Rito 2013	Child mean age 8.6 years
Robertson 2013	Primary outcome was not fruit or vegetable intake; primary outcome was waist circumference and self-esteem
Robson 2019	Primary outcome BMI z-score, as reported in trial registration
Roche 2016	Not RCT: quasi-experimental non-randomised study
Rogers 2013	Child mean age 11 years
Rohde 2017	As per trial registry, fruit and vegetable not primary outcome, anthropometry is primary outcome
Rohlfs 2013	Not RCT
Romo 2018	Not RCT
Romo-Palafox 2017	No comparison group
Rubenstein 2010	No fruit or vegetable intake outcome, only assessed child-feeding practices
Ruottinen 2008	The intervention programme was not specifically designed to increase consumption of fruit and vegetables. The aim of intervention, as reported in a separate paper (Lapinleimu 1995) is "to investigate the effects of an individually supervised, eucaloric, diet with low content of fat, saturated fat and cholesterol in healthy children"

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Study	Reason for exclusion
Russell 2018	Not RCT, review, data drawn from multiple excluded trials Campbell 2013; Taylor 2010
Salminen 2005	Children aged 6-17 years
Salvy 2018	Primary outcome weight
Sanders 2014	Primary outcome was not fruit or vegetable intake; primary outcome was BMI
Sanigorski 2008	Child mean age 8 years
Sanjur 1990	No fruit and vegetable outcome
Sanna 2011	Intervention was not designed to increase fruit and/or vegetable consumption, intervention focused on dietary fat quality
Savage 2010	Comparison between treatment groups not reported for fruit and vegetable consumption
Scherr 2017	Participants were 4th grade students
Schmied 2015	Participants were parents of children with mean age of 10 years
Schuler 2019	No child fruit or vegetable intake outcome
Schumacher 2015	Child participants had median age of 12.9 years
Schwartz 2007a	Study design used convenience sample
Schwartz 2007b	Quasi-experimental: 2 elementary schools randomly allocated to 1 intervention and 1 control
Schwartz 2015	Not RCT
Shahriarzadeh 2017	Children aged 6-12 years, as reported by trial registration
Sharafi 2016	Intervention did not aim to increase consumption of fruit or vegetables
Sharma 2016	Participants were 1st grade children
Sharps 2016	Participants were children aged 6-11 years
Sherwood 2013	Primary outcome was not fruit or vegetable intake; primary outcome was BMI
Shilts 2014	Not RCT as confirmed by trial author
Shim 2011	No child fruit or vegetable intake outcome
Shin 2014	Participants were 4th-6th grade children
Siega-Riz 2004	No comparison group
Singh 2018	Not RCT
Skouteris 2014	No child fruit or vegetable intake outcome
Slusser 2012	Primary outcome was not fruit or vegetable intake; primary outcome was BMI

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Study	Reason for exclusion
Smethers 2019	Primary outcome differences in food and beverage intake by energy, as reported in trial registration
Smith 2013	No fruit and vegetable intake outcome
Smith 2015	No comparison group
Snelling 2017	Participants were children in grades K-5
Sobko 2011	Primary outcome was not fruit or vegetable intake; primary outcome was BMI
Sobko 2017	Not RCT, related to ongoing study Sobko 2016
Sojkowski 2012	No comparison group
Solomons 1999	Review, not trial, no participants
Song 2016	Participants were 4th and 5th grade students
Sotos-Prieto 2013	Primary outcome was not fruit or vegetable intake; primary outcome was change in overall knowledge, attitudes and habits
Speirs 2013	Participants were parents of elementary school children
Stark 1986	No fruit and vegetable consumption outcome
Stark 2011	Primary outcome was not fruit or vegetable intake; primary outcome was BMI
Steenbock 2017	Not RCT: allocation not randomised
Stern 2018	Participants were parents of children aged 5-13 years
Story 2012	Participants mean age 5.84 years
Suarez-Balcazar 2014	Participants were kindergarten and 1st grade children
Sun 2017	No fruit and vegetable intake outcome
Sweitzer 2010	Primary outcome was not fruit or vegetable intake; primary outcome was observed servings in packed lunch
Tande 2013	No comparison group
Taylor 2007	Child mean age 7.7 years
Taylor 2010	Primary outcome was not fruit or vegetable intake; primary outcome was BMI
Taylor 2013a	Participants were primary school-aged children 4-11 years old
Taylor 2013b	No child fruit or vegetable intake outcome
Taylor 2013c	Primary outcome, as per trial registry, was not fruit or vegetable intake
Taylor 2015a	Not RCT: review

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Study	Reason for exclusion
Taylor 2015b	Participants' mean age 6.5 years
Taylor 2016	Fruit and vegetable intake not primary outcome, primary outcome was anthropometric measures as per trial registry
Te Velde 2008	Children aged 10-13 years
Tharrey 2017	Primary outcome was not fruit and vegetable intake
Thomson 2014	Fruit and vegetable intake not primary outcome, primary outcome was weight-for-length
Timms 2011	Not RCT: editorial
Tobey 2016	Not RCT: allocation not random
Tomayko 2016	Fruit and vegetable intake not primary outcome, primary outcome was BMI
Tomayko 2017	Not RCT: allocation not random
Tovar 2017	Not RCT: uses baseline data from an ongoing study, Østbye 2015
Tran 2017	Not RCT
Trees 2012	No comparison group: cross-sectional survey
Tucker 2011	Participants were 4th and 5th grade school children
Tucker 2019	Not RCT
Tully 2018	Not RCT
Turnwald 2017	Intervention conducted in a university cafeteria
Tyler 2016	Participants were aged 8-12 years
Uicab-Pool 2009	Outcome was eating habits
Upton 2013	Participants were primary school children aged 4-11 years
Urrutia 2017	Not RCT
Utter 2017	Not a RCT
Van Horn 2005	Children aged 8-10 years
Van Horn 2011	Not RCT: editorial
Van Nassau 2015	Not RCT: commentary
Vandeweghe 2016	No fruit and vegetable intake outcome
Vaughn 2017	No fruit and vegetable consumption outcome, related to ongoing study Østbye 2015
Vecchiarelli 2005	Children school-aged

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Study	Reason for exclusion
Vega 2018	Not RCT
Veldhuis 2009	Outcome was weight, not fruit and vegetable consumption
Viggiano 2012	Children aged 9-19 years
Vio 2014	Not RCT
Vitolo 2005	Primary outcome is exclusive breastfeeding, as reported in trial registration
Vitolo 2010	Primary outcome was not fruit or vegetable intake; primary outcome was Healthy Eating Index
Vitolo 2014	Fruit and vegetable intake not primary outcome, as per trial registry primary outcome was exclusive breastfeeding
Wald 2017	Participants had mean age of 5.5 years (intervention) or 5.4 years (control)
Walsh 2016	Not RCT
Walton 2015	Primary outcome, as per trial registry, was not fruit or vegetable intake; primary outcome was BMI
Wansink 2013	Participants were middle school children
Wansink 2014	Participants were middle school children
Wansink 2018	Not RCT
Ward 2011	Primary outcome was not fruit or vegetable intake; primary outcome was percent body fat
Ward 2017	Primary outcome is change in centre's nutrition environments
Wardle 2003b	Child mean age 6 years
Warschburger 2018	Participants were children aged 8-16 years
Wells 2005	Not RCT: cross-sectional
Wen 2007	Primary outcome was not fruit or vegetable intake; primary outcome was BMI
Wen 2011	Primary outcome: duration of breastfeeding and timing of introduction of solids, as described in the published research protocol
Wen 2013	Primary outcome was not fruit or vegetable intake; primary outcome was good eating behaviour
Wen 2017	Fruit and vegetable intake was secondary outcome
Wengreen 2013	Participants were elementary school children
Wengreen 2018	Participants were 1st-6th grade students
Whaley 2010	Study design in intervention and matched control site
Whiteside-Mansell 2017	No fruit and vegetable intake outcome
Wijesinha-Bettoni 2013	Children aged 6-12 years

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Study	Reason for exclusion
Williamson 2013	Participants were primary school children
Wilson 2016	No fruit and vegetable consumption outcome
Wilson 2018	Primary outcome is BMI, as reported in trial registration
Woodruff 2019	Participants were adults
Wright 2018	Mean age of children 7.4 years
Wyatt 2013	Children aged 9-10 years
Wyse 2014	No child fruit or vegetable intake outcome
Yeh 2017	No fruit and vegetable intake outcome
Yin 2012	Intervention was not designed to increase fruit and/or vegetable consumption
Yoong 2017	Fruit and vegetable intake was not primary outcome, primary outcome was children's service compliance with dietary guidelines
Yoong 2019	Primary outcome related to service compliance with nutrition guidelines
Young 2017	No fruit and vegetable intake outcome
Zask 2012	Primary outcome was not fruit or vegetable intake; primary outcome was BMI
Zeinstra 2010	Participants were children with mean age 5.1-5.2 years
Zhou 2016	Participants were young adults
Zhou 2017	Not RCT
Zongrone 2018	No fruit and vegetable consumption outcome
Zota 2016	Child mean age as reported by author 8.6 years
Zotor 2008	Children aged 11-15 years
Østbye 2012	Primary outcome was not fruit or vegetable intake; primary outcome as per trial registry was BMI
Μιχαλοπούλου 2019	Not RCT

BMI: body mass index; **RCT:** randomised controlled trial; **SD:** standard deviation

Characteristics of studies awaiting assessment *[ordered by study ID]*

Coulthard 2017

Methods
Participants
Interventions

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Coulthard 2017 *(Continued)*

Outcomes	
Notes	Insufficient information available in trial registry to determine eligibility (hcoulthard@d-mu.ac.uk)

Hilpert 2019

Methods	
Participants	
Interventions	
Outcomes	
Notes	Study requires translation to determine eligibility

Hoppu 2015

Methods	
Participants	
Interventions	
Outcomes	
Notes	Insufficient information available in trial registry to determine eligibility (mari.sandell@u-tu.fi)

Hull 2014

Methods	
Participants	
Interventions	
Outcomes	
Notes	No full text available to determine eligibility. Contact with trial author reported chapter describing study currently underway

Huye 2018

Methods	
Participants	

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Huye 2018 *(Continued)*

Interventions	
Outcomes	
Notes	Insufficient information in abstract to determine study eligibility regarding outcome: we will contact trial authors to confirm

Karmali 2019

Methods	
Participants	
Interventions	
Outcomes	
Notes	Insufficient information available in trial registry to determine eligibility (jenirwin@uwo.ca)

Kim 2019b

Methods	
Participants	
Interventions	
Outcomes	
Notes	To be contacted to confirm study eligibility regarding participant age and outcome

Lee 2015

Methods	
Participants	
Interventions	
Outcomes	
Notes	Study needs to be translated to determine eligibility

Martinez 2018

Methods	

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Martinez 2018 *(Continued)*

Participants	
Interventions	
Outcomes	
Notes	Author contacted to clarify eligibility on basis of outcome (smartinez@iadb.org)

NCT02069249

Methods	
Participants	
Interventions	
Outcomes	
Notes	Insufficient information available in trial registry to determine eligibility (michal.kahn@flinders.edu.au)

NCT02456623

Methods	
Participants	
Interventions	
Outcomes	
Notes	Insufficient information available in trial registry to determine eligibility (hjanisse@emich.edu)

NCT02789215

Methods	
Participants	
Interventions	
Outcomes	
Notes	Insufficient information available in trial registry to determine eligibility (hjanisse@emich.edu)

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NCT02975232

Methods	
Participants	
Interventions	
Outcomes	
Notes	Insufficient information available in trial registry to determine eligibility (mpolacsek@une.edu)

NCT03363048

Methods	
Participants	
Interventions	
Outcomes	
Notes	Insufficient information available in trial registry to determine eligibility (harna001@umn.edu)

Rodrigo 2018

Methods	
Participants	
Interventions	
Outcomes	
Notes	Insufficient information available in trial registry to determine eligibility (dinithividanage@gmail.com)

Roed 2019

Methods	
Participants	
Interventions	
Outcomes	
Notes	Insufficient information available in protocol to determine eligibility (margrethe.roed@uia.no; nina.c.overby@uia.no)

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Rosas 2017

Methods	
Participants	
Interventions	
Outcomes	
Notes	Insufficient information available in abstract to determine eligibility (imendez@cimat.mx)

Shah 2016

Methods	
Participants	
Interventions	
Outcomes	
Notes	Insufficient information available in trial registry to determine eligibility (marjorie.rosenthal@yale.edu)

Wolnicka 2017

Methods	
Participants	
Interventions	
Outcomes	
Notes	Insufficient information available in abstract to determine eligibility (marjorie.rosenthal@yale.edu)

RCT: randomised controlled trial

Characteristics of ongoing studies *[ordered by study ID]*

Belanger 2016

Trial name or title	Healthy start-Départ santé
Methods	C-RCT
Participants	Approximately 735 children aged 3-5 years from 62 Early Childcare Centres

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Belanger 2016 *(Continued)*

Interventions	Intervention: "The intervention is composed of six interlinked components which are presented in more detail in Fig. 1. These components include: 1) intersectoral partnerships conducive to participatory action that leads to promoting healthy weights in communities and ECC; 2) the Healthy Start-Départ Santé implementation manual for educators on how to integrate healthy eating and physical activity in their centre; 3) customized training, role modelling and monitoring of Healthy Start-Départ Santé in ECC; 4) the evidence-based resource, LEAP-GRANDIR [16], which contains material for both families and educators; 5) supplementary resources from governmental partners; and 6) a knowledge development and exchange (KDE), and communication strategy involving social media and web-resources to raise awareness and mobilize grassroots organizations and communities. Healthy Start-Départ Santé is delivered over 6-8 months and includes a partnership agreement, an initial training session which orients ECC staff to the concepts, the implementation manual and the use of resources, on-going support and monitoring over time, one tailored booster session, and a family day to celebrate the ECC' success at the end of the intervention." Control: "Usual practice controls" "Control sites are given the option of receiving the intervention once their participation in the evaluation has been completed"
Outcomes	Usual intake of fruit and vegetables assessed via parent-reported semi-quantitative, food-frequency questionnaire
Starting date	Participant recruitment began in Autumn 2013
Contact information	Anne Leis: Anne.Leis@usask.ca
Notes	

Blomkvist 2018

Trial name or title	A cluster randomized web-based intervention trial to reduce food neophobia and promote healthy diets among oneyear-old children in kindergarten: study protocol
Methods	Aim: trial aims to develop, measure and compare the effect of 2 different interventions among 1-year-old children in kindergartens to reduce food neophobia and promote healthy diets. Design: 3-arm C-RCT
Participants	N = 210 children born in 2016 attending one of 46 participating kindergartens
Interventions	Intervention group 1: kindergartens will be asked to serve a warm lunch meal with a variety of vegetables 3 days a week during the intervention period which will last for 3 months Intervention group 2: kindergartens will be asked to use given pedagogical tools including sensory lessons (the Sapere method) and advice on meal practice and feeding styles, in addition to serving the same meals as intervention group 1 Control: control kindergartens will continue their usual practices
Outcomes	Primary outcomes: 1. Child vegetable intake assessed at baseline, after the intervention, and at the ages of 36 and 48 months 2. Children's level of food neophobia assessed at baseline, after the intervention, and at the ages of 36 and 48 months

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Blomkvist 2018 *(Continued)*

	3. Child dietary habits and food variety assessed at baseline, after the intervention, and at the ages of 36 and 48 months
Starting date	The trial started in August 2017
Contact information	eli.anne.myrvoll.blomkvist@uia.no
Notes	ISRCTN98064772

Brophy-Herb 2017

Trial name or title	Simply dinner study
Methods	Multiphase Optimization Strategy (MOST), where the main, additive and interactive effects of 6 support strategies are first tested in a screening phase to identify the intervention components most robustly associated with increased family meals and improvements in dietary quality. The MOST factorial design includes 6 intervention components with a Usual Head Start Exposure condition (usual-care control); thus, individual participants are randomised to one of 64 experimental conditions. The 64 experimental conditions result from the crossing of 6 Simply Dinner intervention components, each of which has 2 conditions (present vs not), and reflect all possible pairings of the intervention components, including a no-intervention condition. These components are then tested in the confirming phase via RCT
Participants	Families from Head Start preschools (disadvantaged families)
Interventions	6 intervention components ranging from the most to least intense forms of support 1. Meal delivery (MD): home delivery of pre-made healthy family meals including recipes that are ready to heat and eat 2. Ingredient delivery (ID): home delivery of ingredients with recipes to make and cook healthy family meals 3. Community kitchen (CK): sessions in which families make healthy meals with recipes to take home and cook 4. Didactics healthy eating classes with recipes via the Parents of Preschoolers (POPS) curriculum 5. Cooking demonstration (CD): demonstration of meal preparation with recipes; and 6. Cookware/flatware: delivery of flatware/cookware to utilise for family meals
Outcomes	Children's diet quality over the previous week assessed using the Block Dietary Data Systems Kids Food Screener—Last Week (Version 2)
Starting date	Screening design: "planned completion is Dec 2017" Confirming RCT planned to commence in September 2018
Contact information	Holly-E Brophy-Herb: hbrophy@hdfs.msu.edu
Notes	Clincaltrials.gov Identifier NCT02487251; Registered 26 June 2015

Helle 2017

Trial name or title	Early food for future health: a randomized controlled trial evaluating the effect of an eHealth intervention aiming to promote healthy food habits from early childhood

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Helle 2017 *(Continued)*

Methods	RCT of parents with children aged 3-5 months recruited through Norwegian child health centres and announcements on Facebook Baseline questionnaires assessed eating behaviour and feeding practices, food variety and diet quality. All participants will be followed up at ages 12 and possibly 24 and 48 months, with questionnaires relating to eating behaviour and feeding practices, food variety and diet quality.
Participants	Parents of children aged 3-5 months
Interventions	The intervention group received monthly emails with links to an age-appropriate website when their child was 6 -12 months
Outcomes	Eating behaviour and feeding practices, food variety and diet quality
Starting date	Participant recruitment began in March 2016
Contact information	Christine Helle: christine.helle@uia.no
Notes	ISRCTN13601567

Hennink-Kaminski 2017

Trial name or title	Healthy me, healthy we (HMHW) trial
Methods	2-arm, C-RCT, where childcare centres are randomly assigned to an intervention or waitlist control group
Participants	96 childcare centres located in central North Carolina (NC), USA Classroom teachers of children aged 3-4 years 768 parents and children dyads (aged 3-4 years)
Interventions	8-month social marketing campaign delivered over the year targeting childcare teachers and parents Childcare component involves a kick-off event including hanging of study (HMHW) banner, inviting parents to attend, hanging of classroom poster, signing the Fit Family Promise and engaging in classroom activity. Kick-off event followed by four 6-week classroom units targeting healthy eating and physical activity goals through both classroom and home components. Home components include a family guide (targeted at achieving unit goals) and activity tracker (to track completion of at-home activities), and aim to help parents partner with the childcare centre. Control: waitlist control group
Outcomes	Primary: children's dietary intakes will be assessed using a combination of direct observation of foods and beverages consumed while at the centre and parent-completed food diaries. Dietary intake at child care (outside of parent's supervision) will be assessed by trained data collectors during observations of participating children during breakfast/morning snack, lunch, and afternoon snack using the Diet Observation in Child Care protocol. Children's diet quality will be assessed with Healthy Eating Index (HEI) scores

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Hennink-Kaminski 2017 *(Continued)*

Starting date	October (year unclear)
Contact information	Heidi Hennink-Kaminski: h2kamins@unc.edu
Notes	Registered at ClinicalTrials.gov (NCT0233-345, 23 December 2014)

Horodynski 2011

Trial name or title	The healthy toddlers trial
Methods	RCT
Participants	Approximately 600 children aged 12-26 months recruited from community programmes, immunisation clinics and food pantries
Interventions	Intervention: "HT addresses core nutrition concepts but moves well beyond basic nutrition to address maternal self-efficacy during feeding, appropriate feeding styles, and practices, including skill development to increase success in making these behavioural changes." "The HT intervention consists of eight in-home visits by a specially trained paraprofessional instructor plus four weekly telephone follow-up reinforcement contacts. Particularly for high-risk families with young children, providing services within the context of the family's home environment appears to be a useful and effective strategy to provide parents with information, emotional support, access to other services and direct education [19]. The home-visitation model also engages families who lack transportation or child care, a challenge frequently reported by families with low incomes. Paraprofessional instructors are peer educators who can relate to the target audience. Research shows that people learn best from their peers (people like themselves). Eight home visit sessions have been found to produce behavioral change [20]. At each visit, the paraprofessional spends approximately 1 hour with the mother and toddler dyad. The HT lessons use a variety of techniques and materials to enhance each mother's learning experience and help reinforce knowledge. Each lesson includes opportunities for discussion, hands-on activities, and an opportunity for mothers to practice skills covered in the lesson. The eight lessons include a lesson plan, handouts, and recipes. Mothers receive a notebook binder at the beginning of Lesson 1." Control: "The control group families receive the usual services provided by Building strong families (BSF) or Expanded Food and Nutrition Education Program (EFNEP) in respective states. These families are newly enrolled into BSF or EFNEP as part of the HT study and have not received home visitation previously. The control lessons are similarly delivered as the HT lessons, such that, a paraprofessional instructor provides eight lessons during an in-home visit, which last approximately 60 minutes. However, the control lessons focus on parenting (BSF) or nutrition (EFNEP) and do not include extensive content on feeding toddlers. Paraprofessionals who provide the lessons for the control group families are different to prevent cross contamination between the two groups."
Outcomes	Child fruit and vegetable intake will be assessed via 3-day dietary record of child's intake
Starting date	Unknown
Contact information	Mildred Horodynski: millie@msu.edu
Notes	

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Hughes 2016a

Trial name or title	Strategies for effective eating development—SEEDS: design of an obesity prevention program to promote healthy food preferences and eating self-regulation in children From Low-Income Families
Methods	Aims: 1. develop a scientifically based, culturally relevant, 7-week, family-based obesity prevention programme focused on supporting child eating self-regulation and exploration of novel foods; and 2. test programme efficacy by conducting a RCT among Hispanic families with pre-schoolers at 2 separate locations. Children in the prevention programme are expected to increase eating self-regulation and increase fruit and vegetable intake and variety, and parents will increase responsive feeding behaviours. Design: randomised, controlled prevention programme, pretest, post-test, 6 months, and 12 months
Participants	Recruitment at Head Start districts (Texas; n¼160) and Inspire Child Development Center including Early Childhood Education and Head Start (Washington; n ¼ 160). Sixteen trials with 16–20 parent–child dyads per trial will provide adequate power to detect moderate effects.
Interventions	Multicomponent family-based prevention programme incorporating a dialogue approach to adult learning and self-determination theory
Outcomes	Main outcome measure: child assessments will include observed taste preferences, caloric compensation, and eating in the absence of hunger. Parent assessments will include parent-reported feeding, feeding emotions, acculturation, child eating behaviours, child food preferences, and child dietary intake. Heights and weights will be measured for parent and child.
Starting date	Not stated
Contact information	shughes@bcm.edu
Notes	No trials registration listed

Ingalls 2019

Trial name or title	Family Spirit Nurture (FSN) – a randomized controlled trial to prevent early childhood obesity in American Indian populations: trial rationale and study protocol
Methods	Primary research questions include 1) Is the intervention effective in increasing mothers' likelihood of meeting breastfeeding and complementary feeding recommendations? 2) Does the intervention improve responsive parenting/feeding behaviours? 3) Is the intervention effective in decreasing children's consumption of sugar sweetened beverages, snacks and desserts, and increasing consumption of age-appropriate fruit and vegetables?; 4) Is the intervention effective in increasing children's physical activity levels and decreasing children's screen time and other sedentary activities? 5) Does the intervention improve children's BMI z-scores? Study design: 2-arm RCT
Participants	N = 338 expectant Native American mothers aged 14–24 who are having their first or second baby

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Ingalls 2019 *(Continued)*

Interventions	A home-visiting programme called Family Spirit Nurture (FSN). The intervention includes 36 lessons delivered one-on-one by locally hired Native American Family Health Coaches
Outcomes	Primary outcomes: impact on maternal feeding behaviours; children's healthy diet and physical activity; children's weight status. Secondary measures include maternal psychosocial factors; household food and water security; infant sleep and temperament; and maternal and child metabolic status.
Starting date	25 September 2017
Contact information	aingalls@jhu.edu
Notes	NCT03334266 - Preventing Early Childhood Obesity, Part 2: Family Spirit Nurture, Prenatal - 18 Months

ISRCTN45864056

Trial name or title	First food for infants
Methods	RCT evaluating a cooking intervention to improve parental cooking skills and thereby improve dietary intake in infants aged 6-12 months
Participants	Approximately 160 children aged 5-6 months attending selected public health clinics and their parent(s)
Interventions	Intervention: the intervention group is invited to a 2-day course including some theory of infant nutrition, and a main focus on increasing practical food cooking skills (i.e. how to prepare and cook the first food for infants). They are also taught how to store food and how to be confident in making infants' food themselves. 5 groups of participants attend the course on two different days. Each of the 2 course days lasts 4 h, and parents are given theoretical knowledge about the infant's first food as well as practical knowledge on how to make nutritious and varied food. Control: parents receive a booklet containing recipes for homemade foods for infants.
Outcomes	Food intake, measured using food frequency questionnaire
Starting date	The trial started in June 2012
Contact information	Nina Cecilie Øverby: nina.c.overby@uia.no
Notes	ISRCTN45864056

Lee 2018a

Trial name or title	Design and methodology of a cluster-randomized trial in early care and education centers to meet physical activity guidelines: Sustainability via Active Garden Education (SAGE)
Methods	Aim: the primary objective of the SAGE C-RCT is to determine the impact, transfer, and delivery of a garden-based early care and education centres' physical activity and fruit and vegetables promotion intervention to improve health habits in Hispanic or Latino children aged 3–5 years. Secondary objectives are to investigate the process of delivery by measuring the reach, adoption, and implementation of the intervention.

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Lee 2018a *(Continued)*

	Design: cross-over, C-RCT, implemented in 28 early care and education centre sites in 3 cohorts over 3 years
Participants	Hispanic or Latino children aged 3–5 years attending participating 20 early care and education centres
Interventions	A garden-based early care and education centre physical activity and fruit and vegetables promotion intervention for young children aged 3–5 years in 20 sites. The SAGE curriculum uses the plant lifecycle as a metaphor for human development. Children learn how to plant, water, weed, harvest, and do simple food preparation involving washing, cleaning, and sampling fruit and vegetables along with active learning songs, games, science experiments, mindful eating exercises, and interactive discussions to reinforce various healthy lifestyle topics. Parents will receive newsletters and text messages linked to the curriculum, describing local resources and events, and to remind them about activities and assessments.
Outcomes	Primary outcomes 1. Change physical activity; sedentary time (time frame: 4 assessment periods: baseline, 4 months, 8 months weeks, and 12 months) assessed by ActiGraph accelerometers 2. Fruit and vegetable consumption (time frame: 4 assessment periods: baseline, 4 months, 8 months weeks, and 12 months) 24 h diet recalls
Starting date	30 January 2017
Contact information	releephd@yahoo.com
Notes	NCT03261492

Mehdizadeh 2018

Trial name or title	A customized intervention program aiming to improve healthy eating and physical activity among preschool children: protocol for a randomized controlled trial (Iran Healthy Start Study)
Methods	Objectives 1. To customise and implement the health promotion programme (Iran Healthy Start), aligned with preschool bylaws in Iran 2. To determine whether Iran Healthy Start programme can: a. increase physical activity level and attraction to physical activity among preschoolers b. reduce sedentary behaviours at home among preschoolers c. improve anthropometric parameters in preschoolers toward healthy weights d. improve quality of life in preschoolers e. improve eating habits and nutrition risk among preschoolers 3. To evaluate the feasibility, attrition rate, as well as facilitators and barriers for implementing this programme in Iranian preschools 4. To calibrate measurement tools: validating the Persian translation of Nutrition Screening Tool for Every Preschooler and Children Attraction toward Physical Activity Design: RCT
Participants	N = 300 children attending 1 of 6 child care centres
Interventions	The components of intervention include customised Decoda Web-based resources for children, an implementation guide for educators and managers, training and

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Mehdizadeh 2018 *(Continued)*

	monitoring, communication and knowledge exchange, building partnership, and parent engagement.
Outcomes	1. Anthropometry (children): weight, height, waist and arm circumference, BMI percentile, BMI z-scores for age 2. Nutrition risk (children): Nutrition Screening Tool for Every Preschooler; food intake and eating habits 24-h recall x 3 3. Physical activity level (children): Children's attitude toward physical activity; physical activity level at home; physical activity level by pedometers 4. Quality of life (children): Pediatric Quality of Life Inventory questionnaire
Starting date	Expected recruitment start date 4 October 2017
Contact information	vatan.h@usask.ca
Notes	IRCT2016041927475N1

NCT03229629

Trial name or title	What promotes healthy eating?
Methods	Factorial, RCT
Participants	7200 mother-father-child pairs
Interventions	Group 1: weekly maternal nutrition behaviour-change communication (BCC) sessions for 4 months Group 2: weekly maternal nutrition BCC sessions for 4 months and weekly paternal nutrition BCC sessions for 3 months Group 3: receipt of a food voucher for 6 months (randomly select 1 parent) Group 4: weekly maternal nutrition BCC sessions for 4 months and receipt of a food voucher for 6 months Group 5 weekly maternal nutrition BCC sessions for 4 months and weekly paternal nutrition BCC sessions for 3 months and receipt of a food voucher for 6 months Control group: unspecified
Outcomes	Child dietary diversity score Mean difference in child dietary diversity score defined by consumption of number of food group consumed by a child Food consumption score Mean difference in food consumption score calculated using the frequency of consumption of different food groups consumed by a child.
Starting date	Registration date: 25 July 2017 – status was recruiting
Contact information	Hyuncheol Kim : hk788@cornell.edu
Notes	This trial was registered at clinicaltrials.gov as NCT03229629

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NCT03597061

Trial name or title	Healthy start to feeding intervention
Methods	Aim: the purpose of this research study is to pilot test a prevention programme to promote healthy introduction of solid foods and healthy weight gain among infants. Design: 2-arm RCT (no intervention control)
Participants	N = 40 infants aged 2-3 months at study recruitment
Interventions	Participants and their parents will participate in a 3-session intervention targeting healthy introduction of complementary foods. Intervention sessions will occur when the infant is 4, 6, and 9 months of age.
Outcomes	Weight-for-Length Percentile Appetite Fruit and Vegetable Variety
Starting date	1 November 2018
Contact information	Cathleen.Stough@uc.edu
Notes	NCT03597061

Risica 2019

Trial name or title	Improving nutrition and physical activity environments of family child care homes: the rationale, design and study protocol of the 'Healthy Start/Comienzos Sanos' cluster randomized trial
Methods	C-RCT
Participants	N = 132 family child care providers (FCCPs) who care for 2–5-year old children
Interventions	The intervention will integrate: 1. support from peer counsellors with child care experience who will serve as team leaders for groups of FCCPs; 2. tailored print and video materials; and 3. a set of portable active toys.
Outcomes	Primary outcomes include children's dietary quality, physical activity and sedentary behaviours, screen-time at FCCHs. Secondary outcomes include the food, physical activity and screen-time environments of FCCHs and the food and activity-related practices of FCCP.
Starting date	December 2015
Contact information	patricia_risica@brown.edu
Notes	NCT02452645

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Seguin 2017

Trial name or title	Farm fresh foods for healthy kids (F3HK)
Methods	The Farm Fresh Foods for Healthy Kids community-based, randomised intervention trial will build on formative and longitudinal research to examine the impact of cost-offset community supported agriculture on diet and other health behaviours as well as the economic impacts on local economies. In each programme, families will be recruited to join existing community supported agriculture programmes in New York, North Carolina, Vermont, and Washington, and families will be randomised 1:1 to intervention or delayed intervention groups. Data will be collected at baseline, and in the fall and spring for 3 years.
Participants	Low-income families with at least 1 child aged 2-12 years. Target is 240 families (120 per arm)
Interventions	The intervention will involve reduced-price community supported agriculture shares, which can be paid for on a weekly basis, 9 skill-based and seasonally tailored healthy eating classes, and the provision of basic kitchen tools.
Outcomes	Children's intake of fruits and vegetables
Starting date	Unknown
Contact information	rs946@cornell.edu
Notes	NCT02770196

Sobko 2016

Trial name or title	Play and grow
Methods	RCT
Participants	Approximately 240 families with children aged 2-4 years
Interventions	Intervention: "Play & Grow is a 10-week family-based, multi-component healthy lifestyle programme" "The Play & Grow will have educational strategies including instructions, parental peer support and group discussions, and homework tasks, in accordance with the elements developed in our Play & Grow pilot study. Each session will comprise: (i) 15 min of guided active play involving both children and parents; (ii) 15 min of interactive education and skill development for parents; simultaneous supervised active play with foods for children, to promote acceptance of vegetables, and (iii) 15 min of guided active nature games outdoors, involving both children and parents. The sessions will incorporate a lifestyle component, for example: eating, active play and connectedness to nature). These will target the parents' knowledge and skills on how to introduce and maintain their child's correct lifestyle routines. A group leader and co-leader with healthcare backgrounds (and trained by the PI during the Play & Grow pilot study) will facilitate the sessions involving 4 to 5 parent-child dyads. The proposed intervention, we will employ environmental education and nature-related activities to help participating families develop skills conducive to improving playtime and eating habits in children." Control: "The (waiting list or control group) WLCG children will be offered the Play & Grow programme at study completion"
Outcomes	Child fruit and vegetable intake will be assessed using the Eating and Physical Activity Questionnaire (EPAQ) and The Children's Eating Behaviour Questionnaire (CEBQ)
Starting date	Unknown

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Sobko 2016 *(Continued)*

Contact information	Tanja Sobko: tsobko@hku.hk
Notes	

UMIN000033818

Trial name or title	A pilot study for effects of vegetable juice on children's preference and amount of consumption for vegetables
Methods	The aim of the current study is to obtain exploratory pilot data about whether children's preference and amount of consumption for vegetables are increased by repetitive intake of vegetable-juice. Design: Randomised, cluster trial (no treatment control group)
Participants	N = 40, healthy children without any food allergy, aged 3-8 years, both male and female
Interventions	Intervention: with intake of vegetable juice
Outcomes	Primary outcome: amount of vegetable consumption and preference of vegetables in children aged 3-8 years are investigated before/after a 4-week period of repetitive intake of vegetable juice.
Starting date	Anticipated start date 20 August 2018
Contact information	shirai@human.niigata-u.ac.jp
Notes	UMIN000033818

Van der Veek 2019

Trial name or title	Baby's first bites: a randomized controlled trial to assess the effects of vegetable exposure and sensitive feeding on vegetable acceptance, eating behavior and weight gain in infants and toddlers
Methods	4-armed RCT
Participants	240 first-time mothers of healthy, term infants
Interventions	Intervention A: this intervention repeatedly exposed infants and toddlers to vegetables and involved 2 days of pre-test, a 15-day feeding schedule and 2 days of post-test. During 15 consecutive days, children are exposed to 1 of 2 target vegetables according to a set scheme where 1 target vegetable is offered to the infant every other day. On the days in between, infants receive other vegetables for variety. During the feeding schedule on days 5 and 12, mothers will receive a phone call to motivate them to continue exposing their infant to vegetables. When the children are 8, 13 and 16 months of age, mothers will receive a booster phone call to reinforce daily vegetable intake. Mothers are asked to keep serving their infant vegetables on a daily basis and receive a folder that emphasises the importance of repeated exposure to vegetables. Mothers also receive 20 vegetable purées a month, until 5 months after the feeding schedule to reinforce exposure to vegetables. Intervention B: receives an intervention on how to feed their infant, in addition to a 15-day feeding schedule consisting of mostly fruit. The intervention mothers receive purely focuses on the promotion of responsive feeding practices. The intervention mothers will receive the Video-feedback Intervention to promote Positive Parenting -Feeding Infants (VIPP-FI) and will be delivered during home visits. VIPP-FI focuses on improving responsive feeding and sensitive ways of dealing

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Van der Veek 2019 *(Continued)*

	with unwilling infants during the feeding process. Mothers are shown videotapes of their own feeding-interaction with their infant, and receive feedback on these tapes by a trained intervener. Intervention C: will receive a combination of Intervention A and Intervention B. Mothers will be asked to feed the infant according to the schedule for the vegetable-exposure intervention and will also receive feedback on how they should go about feeding their infant according to the VIPP-FI intervention Attention-Control Condition D: receive the same feeding schedule as Intervention B and receive phone calls at the same time-points as the intervention groups in which they will not receive any specific advice, but will be asked about topics such as the general development of the child. If mothers have questions about weaning or feeding, they are referred to "Het Voedingscentrum" or their infant welfare centre
Outcomes	Primary outcomes are vegetable consumption, vegetable liking and self-regulation of energy intake. Secondary outcomes are child eating behaviours, child anthropometrics and maternal feeding behaviour
Starting date	The trial started in April 2016
Contact information	gerry.jager@wur.nl
Notes	NTR6572 and NCT03348176

Watt 2014

Trial name or title	Choosing healthy eating when really young (CHERRY)
Methods	RCT
Participants	Approximately 288 parents of children aged 18 months-5 years from children's centres
Interventions	Intervention: "The intervention group participants attended four sessions (one each week) over 4 weeks. Each session lasted 2 h. The first hour of each session involved parents discussing and learning about a variety of aspects of healthy eating while the children attended a free crèche in the adjacent room (the crèche activities were not considered part of CHERRY and were not monitored). The second hour involved parents. and children together for a more practical, 'hands on' cook and eat session involving basic food preparation and tasting. Each session began with a recap from the previous week and finished with parents being given a 'CHERRY at home' activity to complete before the following week's session; these were both designed to consolidate parents' learning. The intervention group also received SMS reminders via mobile phones between sessions; SMSs included the main messages of the CHERRY programme, as well as reminders to attend each session. The intervention comprised not only individually focused nutrition support, but also encompassed activities directed at developing the capacity of the children's centre to promote and maintain healthy nutritional practices. In the intervention centres, a staff training session was offered to all staff working in the centres. The training session covered various aspects of healthy eating and nutrition for early years and included an introduction and overview of the CHERRY programme. Each training session was tailored to the needs of the staff, as identified by heads of each intervention centre. Intervention centres were also given support and advice to revise and develop their centre's food policies in order to support healthy eating practices and procedures." Control: "The children's centres randomised to the control group did not receive any of the components of the CHERRY programme. During the study period, the control centres agreed not to implement any new nutritional interventions but continued with existing support. On final completion

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Watt 2014 *(Continued)*

	of the study, the CHERRY resources were disseminated to control centres and other early years settings interested in nutrition."
Outcomes	"Child's fruit and vegetable consumption at home (portions per day). This was defined as the total weight (grams) of fruit and vegetables consumed the number of different types of fruit and vegetables consumed, and the actual types of fruit and vegetables consumed. The child's diet was assessed using the **multiple-pass 24-h recall method**. As the children concerned were under 5 years of age, the parents completed the interviews on their behalf."
Starting date	Parents were recruited into the study over 5 recruitment waves between September 2010 and November 2011
Contact information	Richard Geddie Watt: r.watt@ucl.ac.uk
Notes	

Østbye 2015

Trial name or title	Keys to healthy family child care homes (KEYS)
Methods	C-RCT
Participants	Approximately 450 children aged 18 months-4 years from 150 Family Child Care Homes
Interventions	Intervention: "The Keys intervention is delivered over nine months, spending approximately three months on each of three modules. These modules are designed to help providers (1). Modify their own weight-related behaviors so that they can become role models for children (Module 1: Healthy You), (2) create environments that encourage and support children's physical activity and healthy eating habits (Module 2: Healthy Home), and (3) adopt sound business practices that will help them sustain the changes introduced (Module 3: Healthy Business). "The intervention is delivered through workshops, home visits, tailored coaching calls, and educational toolkits." Control: "Participants in the **control arm** receive the Healthy Business" only
Outcomes	Child intake collected using direct observation at the Family Child Care Homes
Starting date	Unknown
Contact information	Courtney Mann: courtney.mann@dm.duke.edu
Notes	

BMI: body mass index; **C-RCT:** cluster-randomised controlled trial; **LGA:** Local Government Area; **RCT:** randomised controlled trial

DATA AND ANALYSES

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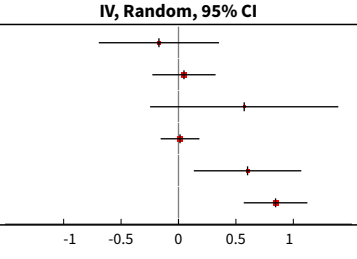
Comparison 1. Short-term impact (< 12 months) of child-feeding intervention versus no intervention

Outcome or subgroup title	No. of studies	No. of partici-pants	Statistical method	Effect size
1 Vegetable intake	18	2004	Std. Mean Difference (Random, 95% CI)	0.42 [0.23, 0.60]
2 Vegetable intake - sensitivity analysis - risk of bias	6	561	Std. Mean Difference (Random, 95% CI)	0.30 [0.09, 0.52]
3 Vegetable intake - sensitivity analysis - primary outcome	13	1561	Std. Mean Difference (Random, 95% CI)	0.50 [0.27, 0.73]
4 Vegetable intake - sensitivity analysis - missing data	11	951	Std. Mean Difference (Random, 95% CI)	0.36 [0.18, 0.54]
5 Vegetable intake - subgroup analysis - modality	18	2004	Std. Mean Difference (Random, 95% CI)	0.42 [0.23, 0.60]
5.1 Face-to-face	13	1579	Std. Mean Difference (Random, 95% CI)	0.42 [0.18, 0.67]
5.2 Other modality	5	425	Std. Mean Difference (Random, 95% CI)	0.40 [0.20, 0.61]
6 Vegetable intake - subgroup analysis - setting	18	2004	Std. Mean Difference (Random, 95% CI)	0.42 [0.23, 0.60]
6.1 School or preschool	6	600	Std. Mean Difference (Random, 95% CI)	0.38 [0.07, 0.69]
6.2 Home	5	551	Std. Mean Difference (Random, 95% CI)	0.53 [0.22, 0.84]
6.3 Home + Lab	2	40	Std. Mean Difference (Random, 95% CI)	0.74 [0.09, 1.39]
6.4 Other settings	5	813	Std. Mean Difference (Random, 95% CI)	0.27 [-0.05, 0.58]

Analysis 1.1. Comparison 1 Short-term impact (< 12 months) of child-feeding intervention versus no intervention, Outcome 1 Vegetable intake.

Study or subgroup	Inter-vention N	Control N	Std. Mean Difference (SE)	Std. Mean Difference IV, Random, 95% CI	Weight	Std. Mean Difference IV, Random, 95% CI
Cohen 1995	34	24	-0.2 (0.267)		5.37%	-0.17[-0.69,0.35]
Cooke 2011	97	106	0 (0.141)		7.83%	0.05[-0.23,0.32]
Cravener 2015	12	12	0.6 (0.418)		3.29%	0.57[-0.25,1.39]
Daniels 2014	266	249	0 (0.086)		8.8%	0.01[-0.16,0.18]
Farrow 2019	40	34	0.6 (0.239)		5.88%	0.6[0.13,1.07]
Fildes 2014	98	123	0.8 (0.141)		7.82%	0.85[0.57,1.12]



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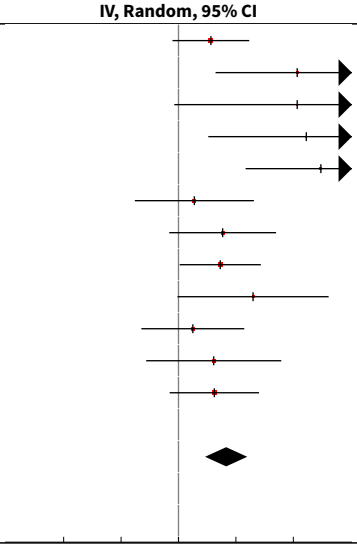
Study or subgroup	Inter-vention N	Control N	Std. Mean Difference (SE)	Std. Mean Difference IV, Random, 95% CI	Weight	Std. Mean Difference IV, Random, 95% CI
Fildes 2015	71	68	0.3 (0.171)		7.23%	0.28[-0.05,0.62]
Hetherington 2015	17	18	1 (0.363)		3.92%	1.03[0.32,1.74]
Keller 2012	7	9	1 (0.546)		2.25%	1.03[-0.04,2.1]
Kim 2018	13	14	1.1 (0.436)		3.11%	1.11[0.26,1.97]
Nekitsing 2019b	47	16	1.2 (0.334)		4.3%	1.24[0.58,1.9]
O'Connell 2012	43	53	0.1 (0.264)		5.41%	0.14[-0.38,0.66]
Owen 2018	48	29	0.4 (0.237)		5.91%	0.38[-0.08,0.85]
Remington 2012	93	47	0.4 (0.18)		7.03%	0.36[0.01,0.72]
Staiano 2016	14	28	0.6 (0.336)		4.28%	0.65[-0.01,1.31]
Wardle 2003a	34	44	0.1 (0.229)		6.07%	0.12[-0.32,0.57]
Zeinstra 2017	75	18	0.3 (0.3)		4.82%	0.31[-0.28,0.89]
Zeinstra 2018	54	49	0.3 (0.199)		6.67%	0.31[-0.08,0.7]
Total (95% CI)					**100%**	**0.42[0.23,0.6]**

Heterogeneity: Tau^2=0.09; Chi^2=53.89, df=17(P<0.0001); I^2=68.45%

Test for overall effect: Z=4.43(P<0.0001)



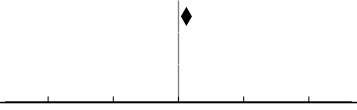
Favours No intervention — Favours Child feeding

Analysis 1.2. Comparison 1 Short-term impact (< 12 months) of child-feeding intervention versus no intervention, Outcome 2 Vegetable intake - sensitivity analysis - risk of bias.

Study or subgroup	Inter-vention N	Control N	Std. Mean Difference (SE)	Std. Mean Difference IV, Random, 95% CI	Weight	Std. Mean Difference IV, Random, 95% CI
Cooke 2011	97	106	0 (0.141)		30.31%	0.05[-0.23,0.32]
Cravener 2015	12	12	0.6 (0.418)		6.06%	0.57[-0.25,1.39]
Farrow 2019	40	34	0.6 (0.239)		15.45%	0.6[0.13,1.07]
Remington 2012	93	47	0.4 (0.18)		22.79%	0.36[0.01,0.72]
Staiano 2016	14	28	0.6 (0.336)		8.91%	0.65[-0.01,1.31]
Wardle 2003a	34	44	0.1 (0.229)		16.47%	0.12[-0.32,0.57]
Total (95% CI)					**100%**	**0.3[0.09,0.52]**

Heterogeneity: Tau^2=0.02; Chi^2=6.9, df=5(P=0.23); I^2=27.58%

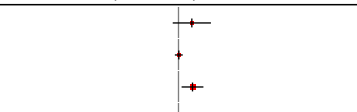
Test for overall effect: Z=2.8(P=0.01)



Favours No intervention — Favours Child Feeding

Analysis 1.3. Comparison 1 Short-term impact (< 12 months) of child-feeding intervention versus no intervention, Outcome 3 Vegetable intake - sensitivity analysis - primary outcome.

Study or subgroup	Inter-vention N	Control N	Std. Mean Difference (SE)	Std. Mean Difference IV, Random, 95% CI	Weight	Std. Mean Difference IV, Random, 95% CI
Cravener 2015	12	12	0.6 (0.418)		4.81%	0.57[-0.25,1.39]
Daniels 2014	266	249	0 (0.086)		11.75%	0.01[-0.16,0.18]
Farrow 2019	40	34	0.6 (0.239)		8.23%	0.6[0.13,1.07]
Fildes 2014	98	123	0.8 (0.141)		10.6%	0.85[0.57,1.12]



Favours No intervention — Favours Child Feeding

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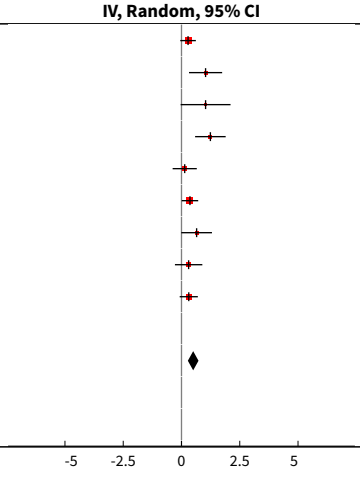
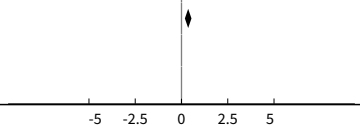
Study or subgroup	Inter-vention N	Control N	Std. Mean Difference (SE)	Std. Mean Difference IV, Random, 95% CI	Weight	Std. Mean Difference IV, Random, 95% CI
Fildes 2015	71	68	0.3 (0.171)		9.9%	0.28[-0.05,0.62]
Hetherington 2015	17	18	1 (0.363)		5.67%	1.03[0.32,1.74]
Keller 2012	7	9	1 (0.546)		3.35%	1.03[-0.04,2.1]
Nekitsing 2019b	47	16	1.2 (0.334)		6.18%	1.24[0.58,1.9]
O'Connell 2012	43	53	0.1 (0.264)		7.63%	0.14[-0.38,0.66]
Remington 2012	93	47	0.4 (0.18)		9.66%	0.36[0.01,0.72]
Staiano 2016	14	28	0.6 (0.336)		6.16%	0.65[-0.01,1.31]
Zeinstra 2017	75	18	0.3 (0.3)		6.86%	0.31[-0.28,0.89]
Zeinstra 2018	54	49	0.3 (0.199)		9.21%	0.31[-0.08,0.7]
Total (95% CI)					**100%**	**0.5[0.27,0.73]**
Heterogeneity: Tau^2=0.11; Chi^2=42.78, df=12(P<0.0001); I^2=71.95%						
Test for overall effect: Z=4.3(P<0.0001)						



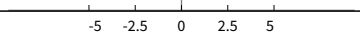
Analysis 1.4. Comparison 1 Short-term impact (< 12 months) of child-feeding intervention versus no intervention, Outcome 4 Vegetable intake - sensitivity analysis - missing data.

Study or subgroup	Inter-vention N	Control N	Std. Mean Difference (SE)	Std. Mean Difference IV, Random, 95% CI	Weight	Std. Mean Difference IV, Random, 95% CI
Cooke 2011	97	106	0 (0.141)		17.33%	0.05[-0.23,0.32]
Cravener 2015	12	12	0.6 (0.418)		4.08%	0.57[-0.25,1.39]
Farrow 2019	40	34	0.6 (0.239)		9.74%	0.6[0.13,1.07]
Fildes 2015	71	68	0.3 (0.171)		14.5%	0.28[-0.05,0.62]
Hetherington 2015	17	18	1 (0.363)		5.19%	1.03[0.32,1.74]
Kim 2018	13	14	1.1 (0.436)		3.81%	1.11[0.26,1.97]
O'Connell 2012	43	53	0.1 (0.264)		8.46%	0.14[-0.38,0.66]
Remington 2012	93	47	0.4 (0.18)		13.68%	0.36[0.01,0.72]
Staiano 2016	14	28	0.6 (0.336)		5.89%	0.65[-0.01,1.31]
Wardle 2003a	34	44	0.1 (0.229)		10.31%	0.12[-0.32,0.57]
Zeinstra 2017	75	18	0.3 (0.3)		7.02%	0.31[-0.28,0.89]
Total (95% CI)					**100%**	**0.36[0.18,0.54]**
Heterogeneity: Tau^2=0.03; Chi^2=14.96, df=10(P=0.13); I^2=33.18%						
Test for overall effect: Z=3.97(P<0.0001)						



Analysis 1.5. Comparison 1 Short-term impact (< 12 months) of child-feeding intervention versus no intervention, Outcome 5 Vegetable intake - subgroup analysis - modality.

Study or subgroup	Inter-vention N	Control N	Std. Mean Difference (SE)	Std. Mean Difference IV, Random, 95% CI	Weight	Std. Mean Difference IV, Random, 95% CI
1.5.1 Face-to-face						
Cohen 1995	34	24	-0.2 (0.267)		5.37%	-0.17[-0.69,0.35]



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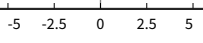
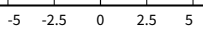
Study or subgroup	Inter-vention N	Control N	Std. Mean Difference (SE)	Std. Mean Difference IV, Random, 95% CI	Weight	Std. Mean Difference IV, Random, 95% CI
Cooke 2011	97	106	0 (0.141)		7.83%	0.05[-0.23,0.32]
Cravener 2015	12	12	0.6 (0.418)		3.29%	0.57[-0.25,1.39]
Daniels 2014	266	249	0 (0.086)		8.8%	0.01[-0.16,0.18]
Fildes 2014	98	123	0.8 (0.141)		7.82%	0.85[0.57,1.12]
Hetherington 2015	17	18	1 (0.363)		3.92%	1.03[0.32,1.74]
Keller 2012	7	9	1 (0.546)		2.25%	1.03[-0.04,2.1]
Kim 2018	13	14	1.1 (0.436)		3.11%	1.11[0.26,1.97]
Nekitsing 2019b	47	16	1.2 (0.334)		4.3%	1.24[0.58,1.9]
O'Connell 2012	43	53	0.1 (0.264)		5.41%	0.14[-0.38,0.66]
Remington 2012	93	47	0.4 (0.18)		7.03%	0.36[0.01,0.72]
Wardle 2003a	34	44	0.1 (0.229)		6.07%	0.12[-0.32,0.57]
Zeinstra 2018	54	49	0.3 (0.199)		6.67%	0.31[-0.08,0.7]
Subtotal (95% CI)					**71.88%**	**0.42[0.18,0.67]**
Heterogeneity: Tau²=0.13; Chi²=50.7, df=12(P<0.0001); I²=76.33%						
Test for overall effect: Z=3.42(P=0)						
1.5.2 Other modality						
Farrow 2019	40	34	0.6 (0.239)		5.88%	0.6[0.13,1.07]
Fildes 2015	71	68	0.3 (0.171)		7.23%	0.28[-0.05,0.62]
Owen 2018	48	29	0.4 (0.237)		5.91%	0.38[-0.08,0.85]
Staiano 2016	14	28	0.6 (0.336)		4.28%	0.65[-0.01,1.31]
Zeinstra 2017	75	18	0.3 (0.3)		4.82%	0.31[-0.28,0.89]
Subtotal (95% CI)					**28.12%**	**0.4[0.2,0.61]**
Heterogeneity: Tau²=0; Chi²=1.84, df=4(P=0.76); I²=0%						
Test for overall effect: Z=3.83(P=0)						
Total (95% CI)					**100%**	**0.42[0.23,0.6]**
Heterogeneity: Tau²=0.09; Chi²=53.89, df=17(P<0.0001); I²=68.45%						
Test for overall effect: Z=4.43(P<0.0001)						
Test for subgroup differences: Chi²=0.01, df=1 (P=0.9), I²=0%						



Analysis 1.6. Comparison 1 Short-term impact (< 12 months) of child-feeding intervention versus no intervention, Outcome 6 Vegetable intake - subgroup analysis - setting.

Study or subgroup	Inter-vention N	Control N	Std. Mean Difference (SE)	Std. Mean Difference IV, Random, 95% CI	Weight	Std. Mean Difference IV, Random, 95% CI
1.6.1 School or preschool						
Cooke 2011	97	106	0 (0.141)		7.83%	0.05[-0.23,0.32]
Nekitsing 2019b	47	16	1.2 (0.334)		4.3%	1.24[0.58,1.9]
O'Connell 2012	43	53	0.1 (0.264)		5.41%	0.14[-0.38,0.66]
Staiano 2016	14	28	0.6 (0.336)		4.28%	0.65[-0.01,1.31]
Zeinstra 2017	75	18	0.3 (0.3)		4.82%	0.31[-0.28,0.89]
Zeinstra 2018	54	49	0.3 (0.199)		6.67%	0.31[-0.08,0.7]
Subtotal (95% CI)					**33.32%**	**0.38[0.07,0.69]**
Heterogeneity: Tau²=0.09; Chi²=12.5, df=5(P=0.03); I²=60.01%						
Test for overall effect: Z=2.41(P=0.02)						



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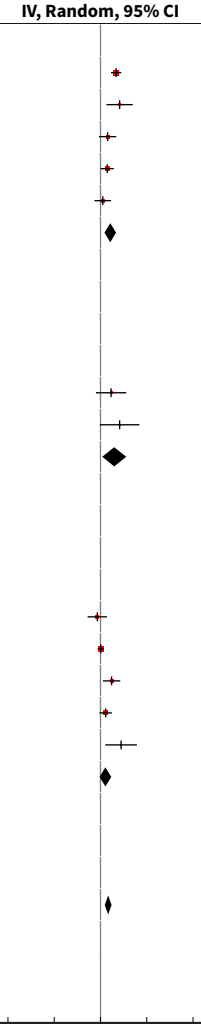
Study or subgroup	Inter-vention N	Control N	Std. Mean Difference (SE)	Std. Mean Difference IV, Random, 95% CI	Weight	Std. Mean Difference IV, Random, 95% CI
1.6.2 Home						
Fildes 2014	98	123	0.8 (0.141)		7.82%	0.85[0.57,1.12]
Hetherington 2015	17	18	1 (0.363)		3.92%	1.03[0.32,1.74]
Owen 2018	48	29	0.4 (0.237)		5.91%	0.38[-0.08,0.85]
Remington 2012	93	47	0.4 (0.18)		7.03%	0.36[0.01,0.72]
Wardle 2003a	34	44	0.1 (0.229)		6.07%	0.12[-0.32,0.57]
Subtotal (95% CI)					**30.75%**	**0.53[0.22,0.84]**
Heterogeneity: Tau^2=0.08; Chi^2=11.14, df=4(P=0.03); I^2=64.08%						
Test for overall effect: Z=3.31(P=0)						
1.6.3 Home + Lab						
Cravener 2015	12	12	0.6 (0.418)		3.29%	0.57[-0.25,1.39]
Keller 2012	7	9	1 (0.546)		2.25%	1.03[-0.04,2.1]
Subtotal (95% CI)					**5.54%**	**0.74[0.09,1.39]**
Heterogeneity: Tau^2=0; Chi^2=0.45, df=1(P=0.5); I^2=0%						
Test for overall effect: Z=2.24(P=0.03)						
1.6.4 Other settings						
Cohen 1995	34	24	-0.2 (0.267)		5.37%	-0.17[-0.69,0.35]
Daniels 2014	266	249	0 (0.086)		8.8%	0.01[-0.16,0.18]
Farrow 2019	40	34	0.6 (0.239)		5.88%	0.6[0.13,1.07]
Fildes 2015	71	68	0.3 (0.171)		7.23%	0.28[-0.05,0.62]
Kim 2018	13	14	1.1 (0.436)		3.11%	1.11[0.26,1.97]
Subtotal (95% CI)					**30.4%**	**0.27[-0.05,0.58]**
Heterogeneity: Tau^2=0.08; Chi^2=12.88, df=4(P=0.01); I^2=68.95%						
Test for overall effect: Z=1.64(P=0.1)						
Total (95% CI)					**100%**	**0.42[0.23,0.6]**
Heterogeneity: Tau^2=0.09; Chi^2=53.89, df=17(P<0.0001); I^2=68.45%						
Test for overall effect: Z=4.43(P<0.0001)						
Test for subgroup differences: Chi^2=2.37, df=1 (P=0.5), I^2=0%						



Comparison 2. Short-term impact (< 12 months) of parent nutrition education intervention versus no intervention

Outcome or subgroup title	No. of studies	No. of partici-pants	Statistical method	Effect size
1 Fruit and vegetable intake	11	3078	Std. Mean Difference (Random, 95% CI)	0.12 [-0.03, 0.28]
2 Fruit and vegetable intake - sensitivity analysis - primary outcome	8	2792	Std. Mean Difference (Random, 95% CI)	0.04 [-0.08, 0.16]
3 Fruit and vegetable intake - sensitivity analysis - missing data	7	2518	Std. Mean Difference (Random, 95% CI)	0.12 [-0.00, 0.24]
4 Fruit and vegetable intake - subgroup analy-sis - modality	11	3078	Std. Mean Difference (Random, 95% CI)	0.12 [-0.03, 0.28]

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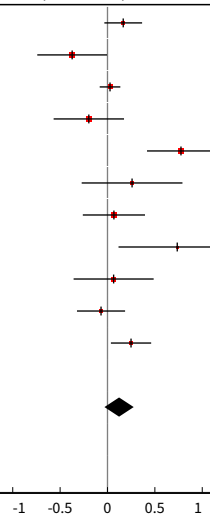
Outcome or subgroup title	No. of studies	No. of partici-pants	Statistical method	Effect size
4.1 Face-to-face only	5	826	Std. Mean Difference (Random, 95% CI)	0.12 [-0.20, 0.45]
4.2 Audio visual only	2	386	Std. Mean Difference (Random, 95% CI)	0.40 [-0.04, 0.85]
4.3 Other modality	4	1866	Std. Mean Difference (Random, 95% CI)	0.03 [-0.16, 0.21]
5 Fruit and vegetable intake - subgroup analysis - setting	11	3078	Std. Mean Difference (Random, 95% CI)	0.12 [-0.03, 0.28]
5.1 Home	5	2047	Std. Mean Difference (Random, 95% CI)	0.06 [-0.16, 0.27]
5.2 Preschool	2	243	Std. Mean Difference (Random, 95% CI)	0.43 [-0.27, 1.13]
5.3 Other settings	4	788	Std. Mean Difference (Random, 95% CI)	0.09 [-0.07, 0.25]

Analysis 2.1. Comparison 2 Short-term impact (< 12 months) of parent nutrition education intervention versus no intervention, Outcome 1 Fruit and vegetable intake.

Study or subgroup	Inter-vention N	Control N	Std. Mean Difference (SE)	Std. Mean Difference IV, Random, 95% CI	Weight	Std. Mean Difference IV, Random, 95% CI
Campbell 2013	195	194	0.2 (0.102)		12.22%	0.17[-0.03,0.37]
Duncanson 2013	62	54	-0.4 (0.188)		8.2%	-0.37[-0.74,-0]
Haire-Joshu 2008	605	701	0 (0.056)		14.25%	0.03[-0.08,0.14]
Martinez-Andrade 2014	99	102	-0.2 (0.19)		8.13%	-0.2[-0.57,0.17]
Roset-Salla 2016	75	74	0.8 (0.183)		8.4%	0.78[0.42,1.13]
Sherwood 2015	26	29	0.3 (0.271)		5.44%	0.26[-0.27,0.79]
Skouteris 2015	74	69	0.1 (0.167)		9.06%	0.07[-0.26,0.4]
Tabak 2012	22	21	0.7 (0.316)		4.42%	0.74[0.12,1.36]
Verbestel 2014	58	36	0.1 (0.216)		7.14%	0.06[-0.36,0.49]
Watt 2009	124	115	-0.1 (0.13)		10.84%	-0.07[-0.32,0.19]
Wyse 2012	174	169	0.2 (0.108)		11.89%	0.25[0.04,0.46]
Total (95% CI)					**100%**	**0.12[-0.03,0.28]**

Heterogeneity: Tau^2=0.04; Chi^2=32.51, df=10(P=0); I^2=69.24%

Test for overall effect: Z=1.55(P=0.12)



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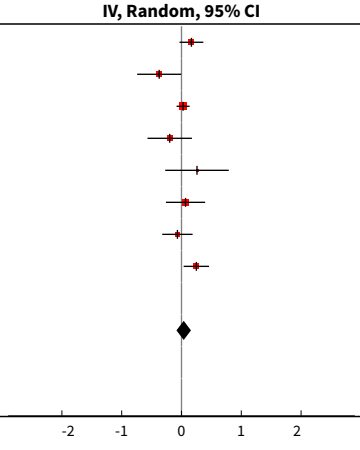
Analysis 2.2. Comparison 2 Short-term impact (< 12 months) of parent nutrition education intervention versus no intervention, Outcome 2 Fruit and vegetable intake - sensitivity analysis - primary outcome.

Study or subgroup	Inter-vention N	Control N	Std. Mean Difference (SE)	Std. Mean Difference IV, Random, 95% CI	Weight	Std. Mean Difference IV, Random, 95% CI
Campbell 2013	195	194	0.2 (0.102)		16.77%	0.17[-0.03,0.37]
Duncanson 2013	62	54	-0.4 (0.188)		8.02%	-0.37[-0.74,-0]
Haire-Joshu 2008	605	701	0 (0.056)		24.52%	0.03[-0.08,0.14]
Martinez-Andrade 2014	99	102	-0.2 (0.19)		7.92%	-0.2[-0.57,0.17]
Sherwood 2015	26	29	0.3 (0.271)		4.45%	0.26[-0.27,0.79]
Skouteris 2015	74	69	0.1 (0.167)		9.46%	0.07[-0.26,0.4]
Watt 2009	124	115	-0.1 (0.13)		13.08%	-0.07[-0.32,0.19]
Wyse 2012	174	169	0.2 (0.108)		15.78%	0.25[0.04,0.46]
Total (95% CI)					**100%**	**0.04[-0.08,0.16]**

Heterogeneity: Tau^2=0.01; Chi^2=13.04, df=7(P=0.07); I^2=46.31%

Test for overall effect: Z=0.6(P=0.55)

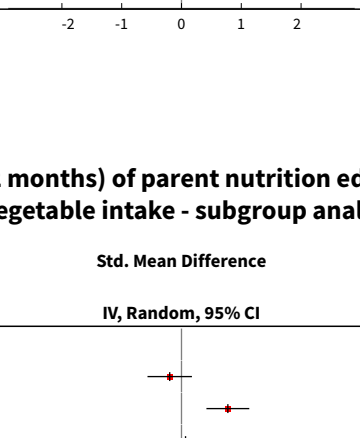


Analysis 2.3. Comparison 2 Short-term impact (< 12 months) of parent nutrition education intervention versus no intervention, Outcome 3 Fruit and vegetable intake - sensitivity analysis - missing data.

Study or subgroup	Inter-vention N	Control N	Std. Mean Difference (SE)	Std. Mean Difference IV, Random, 95% CI	Weight	Std. Mean Difference IV, Random, 95% CI
Campbell 2013	195	194	0.2 (0.102)		19.19%	0.17[-0.03,0.37]
Haire-Joshu 2008	605	701	0 (0.056)		30.12%	0.03[-0.08,0.14]
Sherwood 2015	26	29	0.3 (0.271)		4.6%	0.26[-0.27,0.79]
Skouteris 2015	74	69	0.1 (0.167)		10.17%	0.07[-0.26,0.4]
Tabak 2012	22	21	0.7 (0.316)		3.5%	0.74[0.12,1.36]
Watt 2009	124	115	-0.1 (0.13)		14.51%	-0.07[-0.32,0.19]
Wyse 2012	174	169	0.2 (0.108)		17.91%	0.25[0.04,0.46]
Total (95% CI)					**100%**	**0.12[-0,0.24]**

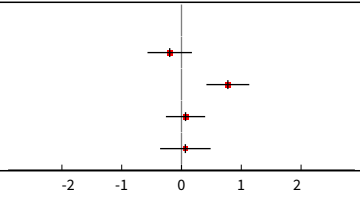
Heterogeneity: Tau^2=0.01; Chi^2=10.07, df=6(P=0.12); I^2=40.43%

Test for overall effect: Z=1.92(P=0.05)



Analysis 2.4. Comparison 2 Short-term impact (< 12 months) of parent nutrition education intervention versus no intervention, Outcome 4 Fruit and vegetable intake - subgroup analysis - modality.

Study or subgroup	Inter-vention N	Control N	Std. Mean Difference (SE)	Std. Mean Difference IV, Random, 95% CI	Weight	Std. Mean Difference IV, Random, 95% CI
2.4.1 Face-to-face only						
Martinez-Andrade 2014	99	102	-0.2 (0.19)		8.13%	-0.2[-0.57,0.17]
Roset-Salla 2016	75	74	0.8 (0.183)		8.4%	0.78[0.42,1.13]
Skouteris 2015	74	69	0.1 (0.167)		9.06%	0.07[-0.26,0.4]
Verbestel 2014	58	36	0.1 (0.216)		7.14%	0.06[-0.36,0.49]



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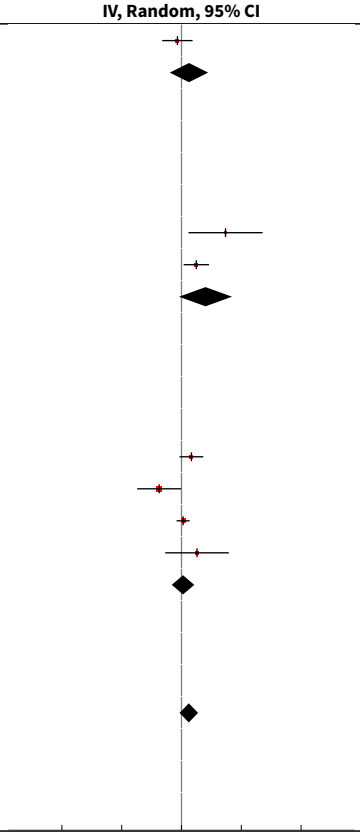
Study or subgroup	Inter-vention N	Control N	Std. Mean Difference (SE)	Std. Mean Difference IV, Random, 95% CI	Weight	Std. Mean Difference IV, Random, 95% CI
Watt 2009	124	115	-0.1 (0.13)		10.84%	-0.07[-0.32,0.19]
Subtotal (95% CI)					**43.58%**	**0.12[-0.2,0.45]**
Heterogeneity: Tau²=0.1; Chi²=17.86, df=4(P=0); I²=77.6%						
Test for overall effect: Z=0.76(P=0.45)						
2.4.2 Audio visual only						
Tabak 2012	22	21	0.7 (0.316)		4.42%	0.74[0.12,1.36]
Wyse 2012	174	169	0.2 (0.108)		11.89%	0.25[0.04,0.46]
Subtotal (95% CI)					**16.31%**	**0.4[-0.04,0.85]**
Heterogeneity: Tau²=0.06; Chi²=2.13, df=1(P=0.14); I²=53.02%						
Test for overall effect: Z=1.77(P=0.08)						
2.4.3 Other modality						
Campbell 2013	195	194	0.2 (0.102)		12.22%	0.17[-0.03,0.37]
Duncanson 2013	62	54	-0.4 (0.188)		8.2%	-0.37[-0.74,-0]
Haire-Joshu 2008	605	701	0 (0.056)		14.25%	0.03[-0.08,0.14]
Sherwood 2015	26	29	0.3 (0.271)		5.44%	0.26[-0.27,0.79]
Subtotal (95% CI)					**40.11%**	**0.03[-0.16,0.21]**
Heterogeneity: Tau²=0.02; Chi²=7.08, df=3(P=0.07); I²=57.65%						
Test for overall effect: Z=0.27(P=0.79)						
Total (95% CI)					**100%**	**0.12[-0.03,0.28]**
Heterogeneity: Tau²=0.04; Chi²=32.51, df=10(P=0); I²=69.24%						
Test for overall effect: Z=1.55(P=0.12)						
Test for subgroup differences: Chi²=2.39, df=1 (P=0.3), I²=16.25%						



Analysis 2.5. Comparison 2 Short-term impact (< 12 months) of parent nutrition education intervention versus no intervention, Outcome 5 Fruit and vegetable intake - subgroup analysis - setting.

Study or subgroup	Inter-vention N	Control N	Std. Mean Difference (SE)	Std. Mean Difference IV, Random, 95% CI	Weight	Std. Mean Difference IV, Random, 95% CI
2.5.1 Home						
Duncanson 2013	62	54	-0.4 (0.188)		8.2%	-0.37[-0.74,-0]
Haire-Joshu 2008	605	701	0 (0.056)		14.25%	0.03[-0.08,0.14]
Tabak 2012	22	21	0.7 (0.316)		4.42%	0.74[0.12,1.36]
Watt 2009	124	115	-0.1 (0.13)		10.84%	-0.07[-0.32,0.19]
Wyse 2012	174	169	0.2 (0.108)		11.89%	0.25[0.04,0.46]
Subtotal (95% CI)					**49.6%**	**0.06[-0.16,0.27]**
Heterogeneity: Tau²=0.04; Chi²=14.13, df=4(P=0.01); I²=71.68%						
Test for overall effect: Z=0.51(P=0.61)						
2.5.2 Preschool						
Roset-Salla 2016	75	74	0.8 (0.183)		8.4%	0.78[0.42,1.13]
Verbestel 2014	58	36	0.1 (0.216)		7.14%	0.06[-0.36,0.49]
Subtotal (95% CI)					**15.55%**	**0.43[-0.27,1.13]**
Heterogeneity: Tau²=0.21; Chi²=6.33, df=1(P=0.01); I²=84.19%						
Test for overall effect: Z=1.21(P=0.23)						

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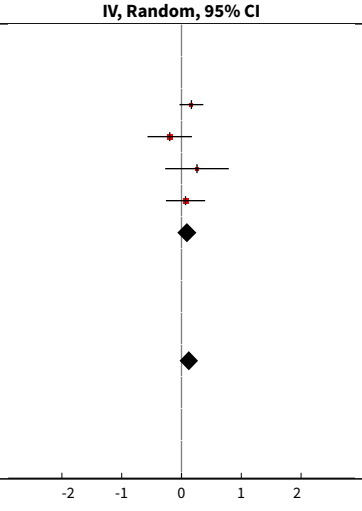
Study or subgroup	Inter-vention N	Control N	Std. Mean Difference (SE)	Std. Mean Difference IV, Random, 95% CI	Weight	Std. Mean Difference IV, Random, 95% CI
2.5.3 Other settings						
Campbell 2013	195	194	0.2 (0.102)		12.22%	0.17[-0.03,0.37]
Martinez-Andrade 2014	99	102	-0.2 (0.19)		8.13%	-0.2[-0.57,0.17]
Sherwood 2015	26	29	0.3 (0.271)		5.44%	0.26[-0.27,0.79]
Skouteris 2015	74	69	0.1 (0.167)		9.06%	0.07[-0.26,0.4]
Subtotal (95% CI)					**34.85%**	**0.09[-0.07,0.25]**
Heterogeneity: Tau^2=0; Chi^2=3.26, df=3(P=0.35); I^2=7.92%						
Test for overall effect: Z=1.1(P=0.27)						
Total (95% CI)					**100%**	**0.12[-0.03,0.28]**
Heterogeneity: Tau^2=0.04; Chi^2=32.51, df=10(P=0); I^2=69.24%						
Test for overall effect: Z=1.55(P=0.12)						
Test for subgroup differences: Chi^2=1.02, df=1 (P=0.6), I^2=0%						



Comparison 3. Short-term impact (< 12 months) of multicomponent intervention versus no intervention

Outcome or subgroup title	No. of studies	No. of partici-pants	Statistical method	Effect size
1 Fruit and vegetable intake	9	3022	Std. Mean Difference (Random, 95% CI)	0.34 [0.10, 0.57]
2 Fruit and vegetable intake - sensitivity analysis - primary outcome	8	2328	Std. Mean Difference (Random, 95% CI)	0.38 [0.11, 0.65]
3 Fruit and vegetable intake - sensitivity analysis - missing data	5	813	Std. Mean Difference (Random, 95% CI)	0.46 [0.13, 0.79]
4 Fruit and vegetable intake - subgroup analysis - modality	9	3022	Std. Mean Difference (Random, 95% CI)	0.34 [0.10, 0.57]
4.1 Face-to-face only	2	67	Std. Mean Difference (Random, 95% CI)	1.06 [0.13, 1.99]
4.2 Face-to-face + written ma-terials	4	2196	Std. Mean Difference (Random, 95% CI)	0.03 [-0.08, 0.14]
4.3 Other modality	3	759	Std. Mean Difference (Random, 95% CI)	0.45 [0.03, 0.88]
5 Fruit and vegetable intake - subgroup analysis - setting	9	3022	Std. Mean Difference (Random, 95% CI)	0.34 [0.10, 0.57]
5.1 School or preschool	5	2221	Std. Mean Difference (Random, 95% CI)	0.21 [-0.07, 0.49]
5.2 Preschool and home	2	462	Std. Mean Difference (Random, 95% CI)	0.66 [0.43, 0.89]
5.3 Other settings	2	339	Std. Mean Difference (Random, 95% CI)	0.16 [-0.18, 0.50]

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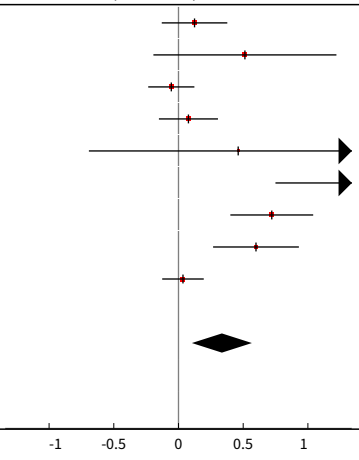
Analysis 3.1. Comparison 3 Short-term impact (< 12 months) of multicomponent intervention versus no intervention, Outcome 1 Fruit and vegetable intake.

Study or subgroup	Inter-vention N	Control N	Std. Mean Difference (SE)	Std. Mean Difference IV, Random, 95% CI	Weight	Std. Mean Difference IV, Random, 95% CI
De Coen 2012	396	298	0.1 (0.129)		13.83%	0.12[-0.13,0.38]
Hong 2018b	22	20	0.5 (0.361)		6.52%	0.51[-0.19,1.22]
Kobel 2019	318	240	-0.1 (0.091)		15.08%	-0.06[-0.23,0.12]
Kristiansen 2019	137	160	0.1 (0.116)		14.27%	0.08[-0.15,0.31]
Namenek Brouwer 2013	6	6	0.5 (0.589)		3.25%	0.46[-0.69,1.62]
Nekitsing 2019b	39	16	1.4 (0.351)		6.75%	1.44[0.75,2.12]
Nicklas 2017	128	125	0.7 (0.163)		12.59%	0.72[0.4,1.04]
Smith 2017	143	66	0.6 (0.169)		12.37%	0.6[0.27,0.93]
Williams 2014	440	462	0 (0.082)		15.34%	0.03[-0.13,0.2]
Total (95% CI)					**100%**	**0.34[0.1,0.57]**

Heterogeneity: Tau^2=0.08; Chi^2=41.53, df=8(P<0.0001); I^2=80.74%

Test for overall effect: Z=2.83(P=0)

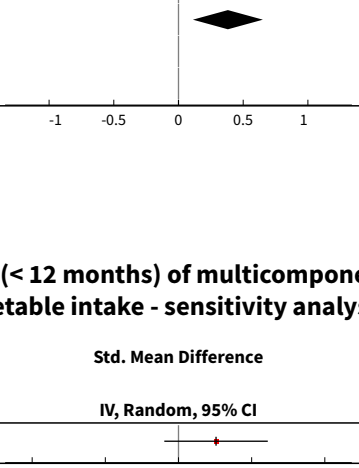


Analysis 3.2. Comparison 3 Short-term impact (< 12 months) of multicomponent intervention versus no intervention, Outcome 2 Fruit and vegetable intake - sensitivity analysis - primary outcome.

Study or subgroup	Inter-vention N	Control N	Std. Mean Difference (SE)	Std. Mean Difference IV, Random, 95% CI	Weight	Std. Mean Difference IV, Random, 95% CI
Hong 2018b	22	20	0.5 (0.361)		8.13%	0.51[-0.19,1.22]
Kobel 2019	318	240	-0.1 (0.091)		16.95%	-0.06[-0.23,0.12]
Kristiansen 2019	137	160	0.1 (0.116)		16.19%	0.08[-0.15,0.31]
Namenek Brouwer 2013	6	6	0.5 (0.589)		4.23%	0.46[-0.69,1.62]
Nekitsing 2019b	39	16	1.4 (0.351)		8.39%	1.44[0.75,2.12]
Nicklas 2017	128	125	0.7 (0.163)		14.57%	0.72[0.4,1.04]
Smith 2017	143	66	0.6 (0.169)		14.35%	0.6[0.27,0.93]
Williams 2014	440	462	0 (0.082)		17.19%	0.03[-0.13,0.2]
Total (95% CI)					**100%**	**0.38[0.11,0.65]**

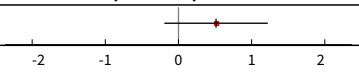
Heterogeneity: Tau^2=0.1; Chi^2=41.47, df=7(P<0.0001); I^2=83.12%

Test for overall effect: Z=2.77(P=0.01)



Analysis 3.3. Comparison 3 Short-term impact (< 12 months) of multicomponent intervention versus no intervention, Outcome 3 Fruit and vegetable intake - sensitivity analysis - missing data.

Study or subgroup	Inter-vention N	Control N	Std. Mean Difference (SE)	Std. Mean Difference IV, Random, 95% CI	Weight	Std. Mean Difference IV, Random, 95% CI
Hong 2018b	22	20	0.5 (0.361)		13.35%	0.51[-0.19,1.22]



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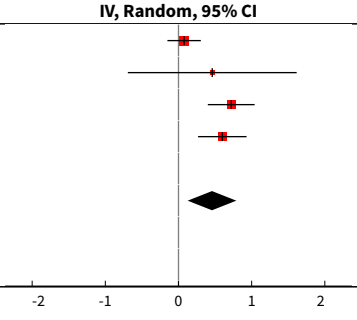
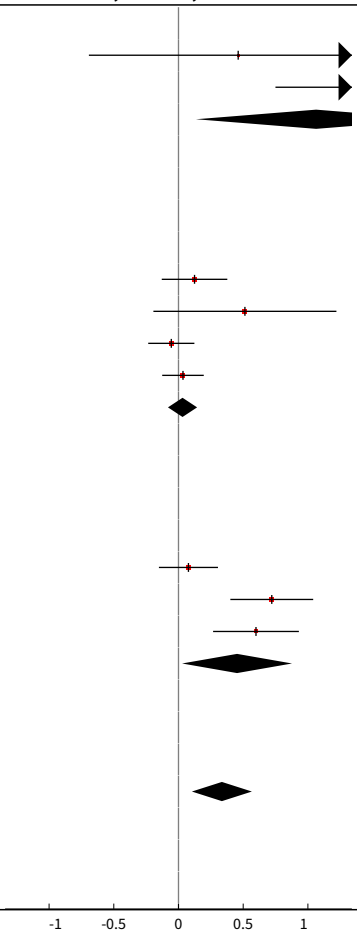
Study or subgroup	Inter-vention N	Control N	Std. Mean Difference (SE)	Std. Mean Difference IV, Random, 95% CI	Weight	Std. Mean Difference IV, Random, 95% CI
Kristiansen 2019	137	160	0.1 (0.116)		29.07%	0.08[-0.15,0.31]
Namenek Brouwer 2013	6	6	0.5 (0.589)		6.66%	0.46[-0.69,1.62]
Nicklas 2017	128	125	0.7 (0.163)		25.67%	0.72[0.4,1.04]
Smith 2017	143	66	0.6 (0.169)		25.24%	0.6[0.27,0.93]
Total (95% CI)					**100%**	**0.46[0.13,0.79]**
Heterogeneity: Tau²=0.09; Chi²=12.97, df=4(P=0.01); I²=69.15%						
Test for overall effect: Z=2.7(P=0.01)						



Analysis 3.4. Comparison 3 Short-term impact (< 12 months) of multicomponent intervention versus no intervention, Outcome 4 Fruit and vegetable intake - subgroup analysis - modality.

Study or subgroup	Inter-vention N	Control N	Std. Mean Difference (SE)	Std. Mean Difference IV, Random, 95% CI	Weight	Std. Mean Difference IV, Random, 95% CI
3.4.1 Face-to-face only						
Namenek Brouwer 2013	6	6	0.5 (0.589)		3.25%	0.46[-0.69,1.62]
Nekitsing 2019b	39	16	1.4 (0.351)		6.75%	1.44[0.75,2.12]
Subtotal (95% CI)					**10%**	**1.06[0.13,1.99]**
Heterogeneity: Tau²=0.24; Chi²=2.03, df=1(P=0.15); I²=50.62%						
Test for overall effect: Z=2.24(P=0.02)						
3.4.2 Face-to-face + written materials						
De Coen 2012	396	298	0.1 (0.129)		13.83%	0.12[-0.13,0.38]
Hong 2018b	22	20	0.5 (0.361)		6.52%	0.51[-0.19,1.22]
Kobel 2019	318	240	-0.1 (0.091)		15.08%	-0.06[-0.23,0.12]
Williams 2014	440	462	0 (0.082)		15.34%	0.03[-0.13,0.2]
Subtotal (95% CI)					**50.77%**	**0.03[-0.08,0.14]**
Heterogeneity: Tau²=0; Chi²=3.21, df=3(P=0.36); I²=6.53%						
Test for overall effect: Z=0.54(P=0.59)						
3.4.3 Other modality						
Kristiansen 2019	137	160	0.1 (0.116)		14.27%	0.08[-0.15,0.31]
Nicklas 2017	128	125	0.7 (0.163)		12.59%	0.72[0.4,1.04]
Smith 2017	143	66	0.6 (0.169)		12.37%	0.6[0.27,0.93]
Subtotal (95% CI)					**39.23%**	**0.45[0.03,0.88]**
Heterogeneity: Tau²=0.12; Chi²=12.79, df=2(P=0); I²=84.36%						
Test for overall effect: Z=2.09(P=0.04)						
Total (95% CI)					**100%**	**0.34[0.1,0.57]**
Heterogeneity: Tau²=0.08; Chi²=41.53, df=8(P<0.0001); I²=80.74%						
Test for overall effect: Z=2.83(P=0)						
Test for subgroup differences: Chi²=7.96, df=1 (P=0.02), I²=74.88%						



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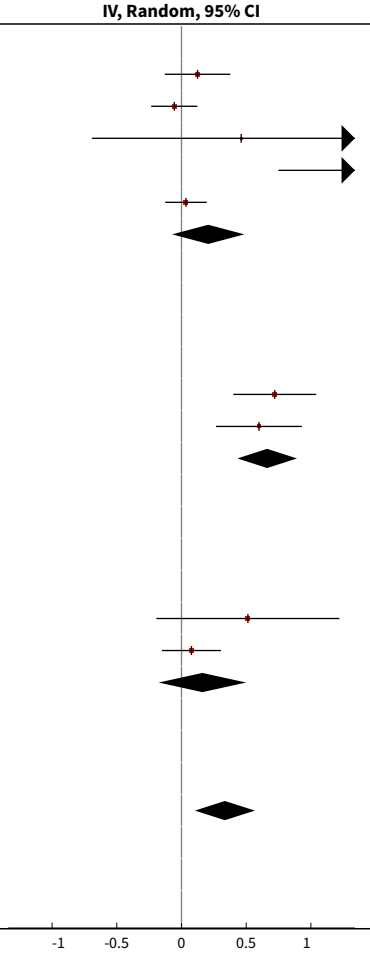
Analysis 3.5. Comparison 3 Short-term impact (< 12 months) of multicomponent intervention versus no intervention, Outcome 5 Fruit and vegetable intake - subgroup analysis - setting.

Study or subgroup	Inter-vention N	Control N	Std. Mean Difference (SE)	Std. Mean Difference IV, Random, 95% CI	Weight	Std. Mean Difference IV, Random, 95% CI
3.5.1 School or preschool						
De Coen 2012	396	298	0.1 (0.129)		13.83%	0.12[-0.13,0.38]
Kobel 2019	318	240	-0.1 (0.091)		15.08%	-0.06[-0.23,0.12]
Namenek Brouwer 2013	6	6	0.5 (0.589)		3.25%	0.46[-0.69,1.62]
Nekitsing 2019b	39	16	1.4 (0.351)		6.75%	1.44[0.75,2.12]
Williams 2014	440	462	0 (0.082)		15.34%	0.03[-0.13,0.2]
Subtotal (95% CI)					**54.25%**	**0.21[-0.07,0.49]**
Heterogeneity: Tau^2=0.06; Chi^2=17.82, df=4(P=0); I^2=77.56%						
Test for overall effect: Z=1.45(P=0.15)						
3.5.2 Preschool and home						
Nicklas 2017	128	125	0.7 (0.163)		12.59%	0.72[0.4,1.04]
Smith 2017	143	66	0.6 (0.169)		12.37%	0.6[0.27,0.93]
Subtotal (95% CI)					**24.96%**	**0.66[0.43,0.89]**
Heterogeneity: Tau^2=0; Chi^2=0.27, df=1(P=0.6); I^2=0%						
Test for overall effect: Z=5.64(P<0.0001)						
3.5.3 Other settings						
Hong 2018b	22	20	0.5 (0.361)		6.52%	0.51[-0.19,1.22]
Kristiansen 2019	137	160	0.1 (0.116)		14.27%	0.08[-0.15,0.31]
Subtotal (95% CI)					**20.79%**	**0.16[-0.18,0.5]**
Heterogeneity: Tau^2=0.02; Chi^2=1.33, df=1(P=0.25); I^2=24.53%						
Test for overall effect: Z=0.94(P=0.35)						
Total (95% CI)					**100%**	**0.34[0.1,0.57]**
Heterogeneity: Tau^2=0.08; Chi^2=41.53, df=8(P<0.0001); I^2=80.74%						
Test for overall effect: Z=2.83(P=0)						
Test for subgroup differences: Chi^2=8.71, df=1 (P=0.01), I^2=77.04%						



APPENDICES

Appendix 1. Cochrane's living systematic review pilots

Living systematic reviews offer a new approach to review updating in which the review is continually updated, incorporating relevant new evidence as it becomes available (Elliott (in press)). Cochrane is exploring the feasibility of preparing and publishing living systematic reviews in a series of pilots, which includes this review. For the Cochrane pilots, searching is being conducted monthly, and we will incorporate new relevant evidence (studies, data or other information) into the review in a timely manner, so that the findings of the review remain current.

For the most up-to-date information about the review, the results of the searches and any new evidence being incorporated, we encourage readers to check the update status information. We will revise the update status information whenever the searches are re-run. We will update the review with a new citation whenever we find a new trial, or relevant information about already-included trials (e.g. new outcome data).

Appendix 2. Search strategies

CENTRAL

#1 MeSH descriptor Fruit explode all trees

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#2 MeSH descriptor Citrus explode all trees

#3 MeSH descriptor Vegetables explode all trees

#4 fruit*

#5 vegetable*

#6 orange*

#7 apple*

#8 (pear or pears)

#9 (grape or grapes)

#10 banana*

#11 (berry or berries):ti,ab,kw

#12 citrus

#13 carrot*

#14 "greens"

#15 cabbage*

#16 brassica*

#17 blackberr*

#18 blueberr*

#19 cranberr*

#20 kiwi*

#21 guava*

#22 lingonberr*

#23 mango*

#24 melon*

#25 papaya*

#26 pineapple*

#27 raspberr*

#28 strawberr*

#29 tomato*

#30 grapefruit*

#31 mandarin*

#32 satsuma*

#33 tangerine*

#34 (plum or plums)

#35 apricot*

#36 (cherry or cherries)

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#37 nectarine*

#38 (peach or peaches)

#39 celery

#40 spinach*

#41 (salad or salads)

#42 (pea or peas)

#43 (bean or beans)

#44 broccoli

#45 cauliflower*

#46 beetroot*

#47 (turnip* or potato* or onion*)

#48 rhubarb

#49 MeSH descriptor Food Habits, this term only

#50 MeSH descriptor Food Preferences, this term only

#51 (health* next eating) or (food next habit*) or (food next preference*) or (eating next habit*) or (eating next preference*) or (eating next behavi*)

#52 (#1 OR #2 OR #3 OR #4 OR #5 OR #6 OR #7 OR #8 OR #9 OR #10)

#53 (#11 OR #12 OR #13 OR #14 OR #15 OR #16 OR #17 OR #18 OR #19 OR #20)

#54 (#21 OR #22 OR #23 OR #24 OR #25 OR #26 OR #27 OR #28 OR #29 OR #30)

#55 (#31 OR #32 OR #33 OR #34 OR #35 OR #36 OR #37 OR #38 OR #39 OR #40)

#56 (#41 OR #42 OR #43 OR #44 OR #45 OR #46 OR #47 OR #48 OR #49 OR #50 OR #51)

#57 (#52 OR #53 OR #54 OR #55 OR #56)

#58 MeSH descriptor Health Education explode all trees

#59 MeSH descriptor Health Promotion explode all trees

#60 MeSH descriptor Behavior Therapy explode all trees

#61 MeSH descriptor Counseling explode all trees

#62 MeSH descriptor Organizational Policy, this term only

#63 MeSH descriptor Public Policy, this term only

#64 MeSH descriptor Health Policy explode all trees

#65 MeSH descriptor Inservice Training explode all trees

#66 promot*

#67 educat*

#68 program*

#69 (policy or policies)

#70 train*

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#71 (diet* near/6 intervention*)

#72 (behavi* near/6 intervention*)

#73 (#58 OR #59 OR #60 OR #61 OR #62 OR #63 OR #64 OR #65 OR #66)

#74 (#67 OR #68 OR #69 OR #70 OR #71 OR #72)

#75 (#73 OR #74)

#76 MeSH descriptor Infant explode all trees

#77 MeSH descriptor Child, Preschool, this term only

#78 (child or children)

#79 (pre-school* or preschool*)

#80 (infant or infants or infancy)

#81 (nursery or nurseries or kindergarten)

#82 MeSH descriptor Parents explode all trees

#83 (parent or parents)

#84 (toddler* or baby or babies)

#85 MeSH descriptor Nurseries, this term only

#86 (#76 OR #77 OR #78 OR #79 OR #80 OR #81 OR #82 OR #83 OR #84 OR #85)

#87 (#57 AND #75 AND #86)

MEDLINE (Ovid)

1. exp Fruit/

2. exp Citrus/

3. exp Vegetables/

4. fruit*.tw.

5. vegetable*.tw.

6. orange*.tw.

7. apple*.tw.

8. (pear or pears).tw.

9. (grape or grapes).tw.

10. banana*.tw.

11. (berry or berries).tw.

12. citrus.tw.

13. carrot*.tw.

14. greens.tw.

15. cabbage*.tw.

16. brassica*.tw.

17. blackberr*.tw.

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18. blueberr*.tw.

19. cranberr*.tw.

20. guava*.tw.

21. kiwi*.tw.

22. lingonberr*.tw.

23. mango*.tw.

24. melon*.tw.

25. papaya*.tw.

26. pineapple*.tw.

27. raspberr*.tw.

28. strawberr*.tw.

29. tomato*.tw.

30. potato*.tw.

31. onion*.tw.

32. grapefruit*.tw.

33. mandarin*.tw.

34. satsuma*.tw.

35. tangerine*.tw.

36. (plum or plums).tw.

37. apricot*.tw.

38. (cherry or cherries).tw.

39. nectarine*.tw.

40. (peach or peaches).tw.

41. celery.tw.

42. spinach*.tw.

43. (salad or salads).tw.

44. (pea or peas).tw.

45. (bean or beans).tw.

46. broccoli.tw.

47. cauliflower*.tw.

48. beetroot*.tw.

49. turnip*.tw.

50. rhubarb.tw.

51. Food Habits/

52. Food Preferences/

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53. ((food or eating) adj (habit* or preference*)).tw.

54. eating behavi*.tw.

55. (health* adj eating).tw.

56. or/1-55

57. exp Health Education/

58. exp Health Promotion/

59. exp Behavior Therapy/

60. exp Counseling/

61. organizational policy/

62. Public Policy/

63. exp Health Policy/

64. exp Inservice Training/

65. promot*.tw.

66. educat*.tw.

67. program*.tw.

68. (policy or policies).tw.

69. train*.tw.

70. (diet* adj6 intervention*).tw.

71. (behavi* adj6 intervention*).tw.

72. or/57-71

73. exp Infant/

74. Child, Preschool/

75. (child or children).tw.

76. (pre-school* or preschool*).tw.

77. (infant or infants).tw.

78. infancy.tw.

79. (nursery or nurseries).tw.

80. exp Parents/

81. (parent or parents).tw.

82. toddler*.tw.

83. Nurseries/

84. (baby or babies).tw.

85. or/73-84

86. 56 and 72 and 85

87. randomized controlled trial.pt.

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88. controlled clinical trial.pt.

89. randomized.ab.

90. placebo.ab.

91. drug therapy.fs.

92. randomly.ab.

93. trial.ab.

94. groups.ab.

95. 87 or 88 or 89 or 90 or 91 or 92 or 93 or 94

96. exp animals/ not humans.sh.

97. 95 not 96

98. 86 and 97

Embase Classic and Embase (Ovid)

1. exp Fruit/

2. exp Vegetables/

3. fruit*.tw.

4. vegetable*.tw.

5. orange*.tw.

6. apple*.tw.

7. (pear or pears).tw.

8. (grape or grapes).tw.

9. banana*.tw.

10. (berry or berries).tw.

11. citrus.tw.

12. carrot*.tw.

13. greens.tw.

14. cabbage*.tw.

15. brassica*.tw.

16. blackberr*.tw.

17. blueberr*.tw.

18. cranberr*.tw.

19. guava*.tw.

20. kiwi*.tw.

21. lingonberr*.tw.

22. mango*.tw.

23. melon*.tw.

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24. papaya*.tw.

25. pineapple*.tw.

26. raspberr*.tw.

27. strawberr*.tw.

28. tomato*.tw.

29. grapefruit*.tw.

30. mandarin*.tw.

31. satsuma*.tw.

32. tangerine*.tw.

33. (plum or plums).tw.

34. apricot*.tw.

35. (cherry or cherries).tw.

36. nectarine*.tw.

37. (peach or peaches).tw.

38. celery.tw.

39. spinach*.tw.

40. (salad or salads).tw.

41. (pea or peas).tw.

42. (bean or beans).tw.

43. onion*.tw.

44. broccoli.tw.

45. cauliflower*.tw.

46. beetroot*.tw.

47. turnip*.tw.

48. rhubarb.tw.

49. potato*.tw.

50. exp feeding behavior/

51. ((food or eating) adj (habit* or preference*)).tw.

52. eating behavi*.tw.

53. (health* adj eating).tw.

54. or/1-53

55. exp health education/

56. consumer health information/

57. behavior therapy/

58. exp counseling/

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59. policy/

60. health care policy/

61. in service training/

62. promot*.tw.

63. educat*.tw.

64. program*.tw.

65. (policy or policies).tw.

66. train*.tw.

67. (diet* adj6 intervention*).tw.

68. (behavi* adj6 intervention*).tw.

69. lifestyle modification/

70. or/55-69

71. exp infant/

72. preschool child/

73. (child or children).tw.

74. (pre-school* or preschool*).tw.

75. (infant or infants).tw.

76. infancy.tw.

77. (nursery or nurseries).tw.

78. exp parent/

79. (parent or parents).tw.

80. toddler/

81. toddler*.tw.

82. nursery/

83. kindergarten/

84. (baby or babies).tw.

85. or/71-84

86. 54 and 70 and 85

87. random$.tw.

88. factorial$.tw.

89. crossover$.tw.

90. cross over$.tw.

91. cross-over$.tw.

92. placebo$.tw.

93. (doubl$ adj blind$).tw.

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94. (singl$ adj blind$).tw.

95. assign$.tw.

96. allocat$.tw.

97. volunteer$.tw.

98. crossover procedure/

99. double blind procedure/

100. randomized controlled trial/

101. single blind procedure/

102. 87 or 88 or 89 or 90 or 91 or 92 or 93 or 94 or 95 or 96 or 97 or 98 or 99 or 100 or 101

103. (animal/ or nonhuman/) not human/

104. 102 not 103

105. 86 and 104

PsycINFO (Ovid)

1. fruit*.tw.

2. vegetable*.tw.

3. orange*.tw.

4. apple*.tw.

5. (pear or pears).tw.

6. (grape or grapes).tw.

7. banana*.tw.

8. (berry or berries).tw.

9. citrus.tw.

10. carrot*.tw.

11. greens.tw.

12. cabbage*.tw.

13. brassica*.tw.

14. blackberr*.tw.

15. blueberr*.tw.

16. cranberr*.tw.

17. guava*.tw.

18. kiwi*.tw.

19. lingonberr*.tw.

20. mango*.tw.

21. melon*.tw.

22. papaya*.tw.

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23. pineapple*.tw.

24. raspberr*.tw.

25. strawberr*.tw.

26. tomato*.tw.

27. grapefruit*.tw.

28. mandarin*.tw.

29. satsuma*.tw.

30. tangerine*.tw.

31. (plum or plums).tw.

32. apricot*.tw.

33. (cherry or cherries).tw.

34. nectarine*.tw.

35. (peach or peaches).tw.

36. celery.tw.

37. spinach*.tw.

38. (salad or salads).tw.

39. (pea or peas).tw.

40. (bean or beans).tw.

41. broccoli.tw.

42. cauliflower*.tw.

43. beetroot*.tw.

44. turnip*.tw.

45. rhubarb.tw.

46. onion*.tw.

47. potato*.tw.

48. eating behavior/

49. food preferences/

50. eating attitudes/

51. (health* adj eating).tw.

52. eating behavi*.tw.

53. ((food or eating) adj (habit* or preference*)).tw.

54. or/1-53

55. health education/

56. health promotion/

57. health literacy/

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58. lifestyle changes/

59. exp behavior therapy/

60. exp counseling/

61. organizational policy/

62. exp policy making/

63. exp inservice training/

64. promot*.tw.

65. educat*.tw.

66. program*.tw.

67. (policy or policies).tw.

68. train*.tw.

69. (diet* adj6 intervention*).tw.

70. (behavi* adj6 intervention*).tw.

71. or/55-70

72. (child or children).tw.

73. (pre-school* or preschool*).tw.

74. (infant or infants).tw.

75. (nursery or nurseries or kindergarten*).tw.

76. (parent or parents).tw.

77. toddler*.tw.

78. (baby or babies).tw.

79. exp parents/

80. exp nursery school students/

81. kindergarten students/

82. infancy.tw.

83. (“120” or “140” or “160”).ag.

84. or/72-83

85. 54 and 71 and 84

86. random$.tw.

87. factorial$.tw.

88. crossover$.tw.

89. cross-over$.tw.

90. placebo$.tw.

91. (doubl$ adj blind$).tw.

92. (singl$ adj blind$).tw.

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93. assign$.tw.

94. allocat$.tw.

95. volunteer$.tw.

96. control*.tw.

97. “2000”.md.

98. or/86-97

99. 85 and 98

CINAHL Plus with Full Text

S102 S83 and S101

S101 S84 or S85 or S86 or S87 or S88 or S89 or S90 or S91 or S92 or S93 or S94 or S95 or S96 or S97 or S98 or S99 or S100

S100 TX cross-over*

S99 TX crossover*

S98 TX volunteer*

S97 (MH “Crossover Design”)

S96 TX allocat*

S95 TX control*

S94 TX assign*

S93 TX placebo*

S92 (MH “Placebos”)

S91 TX random*

S90 TX (doubl* N1 mask*)

S89 TX (singl* N1 mask*)

S88 TX (doubl* N1 blind*)

S87 TX (singl* N1 blind*)

S86 TX (clinic* N1 trial?)

S85 PT clinical trial

S84 (MH “Clinical Trials+”)

S83 S55 and S69 and S82

S82 S70 or S71 or S72 or S73 or S74 or S75 or S76 or S77 or S78 or S79 or S80 or S81

S81 TI kindergarten or AB kindergarten

S80 (MH “Schools, Nursery”)

S79 TI (baby or babies) or AB (baby or babies)

S78 TI toddler* or AB toddler*

S77 TI (parent or parents) or AB (parent or parents)

S76 (MH “Parents+”)

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S75 TI (nursery or nurseries) or AB (nursery or nurseries)

S74 TI (infant or infants or infancy) or AB (infant or infants or infancy)

S73 TI (pre-school* or preschool* or “pre school*”) or AB (pre-school* or preschool* or “pre school*”)

S72 TI (child or children) or AB (child or children)

S71 (MH “Child, Preschool”)

S70 (MH “Infant+”)

S69 S56 or S57 or S58 or S59 or S60 or S61 or S62 or S63 or S64 or S65 or S66 or S67 or S68

S68 TI (behavi* N5 intervention*) or AB (behavi* N5 intervention*)

S67 TI (diet* N5 intervention*) or AB (diet* N5 intervention*)

S66 TI train* or AB train*

S65 TI (policy or policies) or AB (policy or policies)

S64 TI program* or AB program*

S63 TI educat* or AB educat*

S62 TI promot* or AB promot*

S61 (MH “Public Policy+”)

S60 (MH “Organizational Policies+”)

S59 (MH “Counseling+”)

S58 (MH “Behavior Therapy+”)

S57 (MH “Health Promotion+”)

S56 (MH “Health Education+”)

S55 S1 or S2 or S3 or S4 or S5 or S6 or S7 or S8 or S9 or S10 or S11 or S12 or S13 or S14 or S15 or S16 or

S17 or S18 or S19 or S20 or S21 or S22 or S23 or S24 or S25 or S26 or S27 or S28 or S29 or S30 or S31 or S32 or S33 or S34 or S35

or S36 or S37 or S38 or S39 or S40 or S41 or S42 or S43 or S44 or S45 or S46 or S47 or S48 or S49 or S50 or S51 or S52 or S53 or

S54

S54 TI (“food habit*” or “food preference*” or “eating habit*” or “eating preference*”) or AB (“food habit*” or “food preference*” or

“eating habit*” or “eating preference*”)

S53 TI “health* eating” or AB “health* eating”

S52 (MH “Food Preferences”)

S51 (MH “Food Habits”)

S50 TI rhubarb or AB rhubarb

S49 TI onion* or AB onion*

S48 TI potato* or AB potato*

S47 TI turnip* or AB turnip*

S46 TI beetroot* or AB beetroot*

S45 TI cauliflower* or AB cauliflower*

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S44 TI broccoli or AB broccoli

S43 TI (bean or beans) or AB (bean or beans)

S42 TI (pea or peas) or AB (pea or peas)

S41 TI (salad or salads) or AB (salad or salads)

S40 TI spinach* or AB spinach*

S39 TI celery or AB celery

S38 TI (peach or peaches) or AB (peach or peaches)

S37 TI nectarine* or AB nectarine*

S36 TI (cherry or cherries) or AB (cherry or cherries)

S35 TI apricot* or AB apricot*

S34 TI (plum or plums) or AB (plum or plums)

S33 TI tangerine* or AB tangerine*

S32 TI satsuma* or AB satsuma*

S31 TI mandarin* or AB mandarin*

S30 TI grapefruit* or AB grapefruit*

S29 TI tomato* or AB tomato*

S28 TI strawberr* or AB strawberr*

S27 TI raspberr* or AB raspberr*

S26 TI pineapple* or AB pineapple*

S25 TI papaya* or AB papaya*

S24 TI melon* or AB melon*

S23 TI mango* or AB mango*

S22 TI lingonberr* or AB lingonberr*

S21 TI guava* or AB guava*

S20 TI kiwi* or AB kiwi*

S19 TI cranberr* or AB cranberr*

S18 TI blueberr* or AB blueberr*

S17 TI blackberr* or AB blackberr*

S16 TI brassica* or AB brassica*

S15 TI cabbage* or AB cabbage*

S14 TI “greens” or AB “greens”

S13 TI carrot* or AB carrot*

S12 TI citrus or AB citrus

S11 TI (berry or berries) or AB (berry or berries)

S10 TI banana* or AB banana*

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S9 TI (grape or grapes) or AB (grape or grapes)

S8 TI (pear or pears) or AB (pear or pears)

S7 TI apple* or AB apple*

S6 TI orange* or AB orange*

S5 TI vegetable* or AB vegetable*

S4 TI fruit* or AB fruit*

S3 (MH "Vegetables+")

S2 (MH "Citrus+")

S1 (MH "Fruit+")

WHO International Clinical Trials Registry Platform

fruit* or citrus or vegetable* or food habits or food preference* AND infant or child* or preschool or pre-school or parents or nurser*

ClinicalTrials.gov

child* or preschool or infant

Proquest Dissertations & Theses

(fruit or citrus or vegetable or food habits or food preferences) AND (infant or child, preschool or parents or nurser*)

GoogleScholar

(infant or child* or preschool or pre-school) AND (fruit* or vegetable* or food habit or food preference)

Appendix 3. Living systematic review protocol

The methods outlined below are specific to maintaining the review as a living systematic review on the Cochrane Library (1). They will be used immediately upon publication of this update. Core review methods, such as the criteria for considering studies in the review and assessment of risk of bias, are unchanged. As such, below we outline only those areas of the Methods for which additional activities or rules apply.

Search methods for identification of studies

We will re-run electronic database and trial registry searches monthly. For the electronic databases (CENTRAL, Epub Ahead of Print, In-Process & Other Non-Indexed Citations, MEDLINE Daily and MEDLINE and Embase) and other electronic sources (WHO International Clinical Trials Registry Platform and clinicaltrials.gov), we will set up auto-alerts (where possible) to deliver a monthly search yield by email.

We will search other resources (articles published in three relevant international peer reviewed journals: *Journal of Nutrition Education and Behavior, Public Health Nutrition*, and *Journal of the Academy of Nutrition and Dietetics*; database of published dissertations; and grey literature in GoogleScholar) manually every six months.

As additional steps to inform the living systematic review, we will contact corresponding authors of ongoing studies as they are identified and ask them to advise when results are available, or to share early or unpublished data. We will contact the corresponding authors of any newly-included studies for advice about other relevant studies. We will conduct citation tracking of included studies in Web of Science Core Collection on an ongoing basis. For that purpose, we have set up citation alerts in Web of Science Core Collection. We will manually screen the reference list of any newly-included studies and systematic reviews. Also, we will use the 'related citation' feature in PubMed to identify additional articles.

We will review search methods and strategies approximately yearly, to ensure they reflect any terminology changes in the topic area, or in the databases.

Selection of studies

We will immediately screen any new citations retrieved by the monthly searches. As the first step of monthly screening, we will apply the machine learning classifier (RCT model) (Wallace 2017) available in the Cochrane Register of Studies (CRS-Web) (Cochrane 2017a). The classifier assigns a probability (from 0 to 100) to each citation for being a true randomised controlled trial (RCT). For citations that are assigned a probability score of less than 10, the machine learning classifier currently has a specificity/recall of 99.987% (Wallace 2017). We

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will screen citations assigned a score from 10 to 100 in duplicate and independently. Cochrane Crowd (Cochrane 2017b) will screen citations that score 9 or less. Any citations that are deemed to be potential RCTs by Cochrane Crowd will be returned to the authors for screening.

Data synthesis

Whenever we find new evidence (i.e. studies, data or information) meeting the review inclusion criteria, we will extract the data, assess risk of bias and incorporate it in the synthesis every three months, as appropriate.

We will incorporate any new study data into existing meta-analyses using the standard approaches outlined in the Data synthesis section.

Sensitivity analysis

We will not adjust the meta-analyses to account for multiple testing, given that the methods related to frequent updating of meta-analyses are under development (Simmonds 2017).

Other

We will consider the review scope and methods if appropriate in light of potential changes in the topic area, or the evidence being included in the review (e.g. additional comparisons, interventions or outcomes, or new review methods available).

The review is being piloted as a living systematic review up until March 2018.

WHAT'S NEW

Date	Event	Description
29 January 2020	Amended	This is a Living Systematic Review. Searches are run and screened monthly. Search results up to 25 August 2019 are included in the current update (published November 2019). In addition, the team continues with the monthly screening (last search date 25 December 2019) and has found a further two new studies that will be included in a future update.

HISTORY

Protocol first published: Issue 6, 2010
Review first published: Issue 11, 2012

Date	Event	Description
25 October 2019	New search has been performed	We conducted an update of the review, which includes 15 new trials based on a search from 25 August 2019 (Ahern 2019; Bakırcı-Taylor 2019; Carney 2018; Farrow 2019; Hong 2018a; Hong 2018b; Kim 2018; Kobel 2019; Kristiansen 2019; Lanigan 2017; Nekitsing 2019a; Nekitsing 2019b; Owen 2018; Segura-Perez 2017; Zeinstra 2017). This is a Living Systematic Review. Searches are run and screened monthly. The last search for the regular monthly screenings was 25 September 2019 and we found an additional 2 new trials that will be included in the next update.
15 October 2019	New citation required and conclusions have changed	There is moderate-quality evidence that multicomponent interventions increase the consumption of fruit and vegetables amongst children aged five years and under. There remains very low-quality evidence that specific child-feeding practice interventions increase, and parent nutrition education interventions

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Date	Event	Description
		may not be effective in increasing, fruit and vegetable consumption of children aged five and under.
15 March 2018	New citation required and conclusions have changed	There is low-quality and very low-quality evidence respectively that multicomponent and specific child-feeding practice interventions increase the consumption of fruit and vegetable amongst children aged five years and under. There is very low-quality evidence that parent nutrition education interventions may not be effective in increasing fruit and vegetable consumption of children aged five and under.
15 March 2018	New search has been performed	We conducted an update of the review, which includes eight new trials based on a search from 25 January 2018 (Cohen 1995; Forestell 2007; Gerrish 2001; Heath 2014; Kling 2016; Sherwood 2015; Smith 2017; Zeinstra 2018). This is a Living Systematic Review. Searches are run and screened monthly. The last search for the regular monthly screenings was 25 March 2018 and we found an additional four new studies and one ongoing study that will be included after the May 2018 update.
25 February 2018	New search has been performed	This is a Living Systematic Review. Searches are run and screened monthly. Search results up to 25 September 2017 are included in the current update (published January 2018). In addition, the team continues with the monthly screening (last search date 25 January 2018) and has found a further 8 new studies and 4 new ongoing studies that will be included in the next update (expected in May 2018).
25 September 2017	New search has been performed	We conducted an update of the review, which includes five new trials based on a search from 25 September 2017. This is a Living Systematic Review. Searches are run and screened monthly. The last search for the regular monthly screenings was 25 November 2017 and we found an additional seven new studies and four new ongoing studies that will be included after the January 2018 update.
25 September 2017	New citation required but conclusions have not changed	There remains very low-quality evidence that specific child-feeding practice interventions increase the consumption of vegetables amongst children aged five years and under. There is very low-quality evidence that parent nutrition education interventions and multicomponent interventions respectively may not be effective in increasing fruit and vegetable consumption of children aged five and under.
30 September 2016	New search has been performed	We conducted an update of the review which identified 45 new trials eligible for inclusion.
30 September 2016	New citation required and conclusions have changed	There is very low-quality evidence that specific child-feeding practice interventions increase the consumption of vegetables amongst children aged five years and under. There is very low-quality evidence that parent nutrition education interventions and multicomponent interventions respectively may not be effective in increasing fruit and vegetable consumption of children aged five and under.

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CONTRIBUTIONS OF AUTHORS

All review authors contributed to the conception of the research and were involved in the preparation of the review including providing critical comment on drafts.
RH led the review update and manuscript drafting.
RH and KO conducted searches of other sources.
RH and KO screened titles and abstracts.
RH and KO screened full texts to determine trial eligibility.
KO, RW, KB, CB and EJ extracted data from eligible trials.
KO, FS, FT and RS assessed risk of bias.
RH, KO and LW assessed quality of trials (GRADE).

All review authors reviewed and approved the final manuscript.

DECLARATIONS OF INTEREST

Rebecca K Hodder: none known

Kate M O'Brien: none known

Fiona G Stacey: none known

Flora Tzelepis: none known

Rebecca J Wyse: is an author on an included randomised trial of an intervention to increase fruit and vegetable consumption (Wyse 2012); she was not involved in the determination of trial eligibility, data extraction or 'Risk of bias' assessment for this review. She has not received any benefit, in cash or kind, any hospitality, or any subsidy derived from the food industry or any other source perceived to have an interest in the outcome of the review.

Kate M Bartlem: none known

Rachel Sutherland: none known

Erica L James: none known

Courtney Barnes: none known

Luke Wolfenden: is an author on an included randomised trial of an intervention to increase fruit and vegetable consumption (Wyse 2012); he was not involved in the determination of trial eligibility, data extraction or 'Risk of bias' assessment for this review. He has not received any benefit, in cash or kind, any hospitality, or any subsidy derived from the food industry or any other source perceived to have an interest in the outcome of the review.

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Internal sources

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External sources

- No sources of support supplied

DIFFERENCES BETWEEN PROTOCOL AND REVIEW

1. Consistent with the original review (Wolfenden 2012), we excluded trials if fruit or vegetable intake was not the primary trial outcome, to avoid potential confounding effects of other interventions and reduce the risk of publication bias and selective outcome reporting which is more predominate among secondary trial outcomes (or outcomes that were not otherwise stated). This included trials where fruit and vegetable outcomes were assessed within broader targeted interventions. The protocol stated that trials listing fruit and vegetable intake as a secondary trial outcome would also be included. We included trials that did not state a primary outcome, but did report intake of fruit or vegetables or both. We conducted sensitivity analyses to explore the impact on the overall assessment of treatment effects, excluding trials that did not state a primary outcome of children's fruit and vegetable consumption.
2. Consistent with the original review (Wolfenden 2012), we amended classification of intervention effects as 'short-term' from 'three to less than 12 months' in the protocol to less than 12 months in the review.
3. Consistent with the original review (Wolfenden 2012), we did not contact professional associations as part of the review search strategy, nor did we search the National Institute of Health Randomized Trial Records Database.
4. Consistent with the original review (Wolfenden 2012), we amended the title and text throughout the review to ensure consistent terminology for the description of age. Specifically, we replaced the age description of children as 'preschool' with a more precise description of 'children aged five years and under', to more accurately reflect the scope of the review. We refer only to preschools when discussing the findings of trials conducted in that setting.
5. Consistent with the original review (Wolfenden 2012), as some trials included children across a range of ages, we included any trial where the mean age of the sample at baseline was five years or under.
6. For the review update, while two independent reviewers extracted data from each trial, the extraction was undertaken by pairs of reviewers.
7. For the review update, risk of bias was assessed on published trial information and authors of included trials were not contacted to clarify any aspects.
8. For the review update, we did not conduct planned subgroup analyses by interventions of varying intensities, due to insufficient information being reported across the included trials about the number and duration of intervention contacts or components.
9. For the review update, pairs of review authors independently screened articles against all pre-specified eligibility criteria and assessed risk of bias. The sequential method of screening adopted in the original review (that is by order: participants, outcome, comparator, intervention, trial type) was not adopted in the review update.
10. Whilst not explicitly excluded from the original review, for the review update we specifically considered cross-over trials to be an eligible trial design. This was due to the many trials that adopt this design to investigate the effectiveness of interventions to increase the fruit and vegetable consumption of children aged five years and under, and the review authors deeming the trial design to be appropriate in this context.
11. This update includes some new methods relevant for living systematic reviews, which are included in the Methods and also described in Appendix 3.
12. We did not adopt the planned use of the 'Related citation' feature in PubMed to identify additional articles as a component of the living systematic review methods for the current version of the review.
13. The machine learning classifier (RCT model) (Wallace 2017), available in the Cochrane Register of Studies (CRS-Web) (Cochrane 2017a), and Cochrane Crowd (Cochrane 2017b) were not used between May 2018 and August 2019.
14. Screening of relevant systematic reviews was not conducted for the review updates.

INDEX TERMS

Medical Subject Headings (MeSH)

*Eating; *Feeding Behavior; *Fruit; *Vegetables; Conditioning, Psychological; House Calls; Randomized Controlled Trials as Topic; Reward

MeSH check words

Child, Preschool; Humans; Infant

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