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ORIGINAL ARTICLE

General practitioners trained in motivational interviewing can positively affect the attitude to behaviour change in people with type 2 diabetes

*One year follow-up of an RCT, ADDITION Denmark**

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Abstract

Objective. To examine whether training GPs in motivational interviewing (MI) can improve type 2 diabetic patients' (1) understanding of diabetes, (2) beliefs regarding prevention and treatment, and (3) motivation for behaviour change. *Methods.* A randomized controlled trial including 65 GPs and 265 type 2 diabetic patients. The GPs were randomized in two groups, one with and one without MI training. Both groups received training in target-driven intensive treatment of type 2 diabetic patients. The intervention was a 1½-day residential course in MI with ½-day follow-up twice during the first year. The patient data stemmed from previously validated questionnaires. *Main outcome measures.* The Health Care Climates Questionnaire assesses the patient–doctor relationship and type of counselling. The Treatment Self-Regulation Questionnaire assesses the degree to which behaviour tends to be self-determined. The Diabetes Illness Representation Questionnaire assesses beliefs and understanding of type 2 diabetes. The Summary of Diabetes Self Care Activities assesses the extent of various self-care activities related to type 2 diabetes. *Results.* The response rate to our questionnaires was 87%. Patients in the intervention group were significantly more autonomous and motivated in their inclination to change behaviour after one year compared with the patients from the control group. Patients in the intervention group were also significantly more conscious of the importance of controlling their diabetes, and had a significantly better understanding of the possibility of preventing complications. *Conclusion.* MI improved type 2 patients' understanding of diabetes, their beliefs regarding treatment aspects, their contemplation on and motivation for behaviour change. Whether our results can be sustained long term and are clinically relevant in terms of changes in risk profile advocates further research.

Key Words: *Client counselling, diabetes, motivational interviewing, patient counselling, prevention, psychological interview, RCT*

Type 2 diabetes is attracting growing attention due to its rising prevalence, complications, and mortality. This is caused by inexpedient lifestyle behaviour, and failure to adhere to intensive treatment and prescribed medication. "Motivational interviewing" (MI) focuses on motivation for changing behaviour. MI is a scientifically tested method of client counselling [1]. It is viewed as a useful intervention strategy for changing behaviour [2].

In the process of implementation of MI, it is important to focus on the clinical setting into which MI is supposed to be integrated. Most type 2 patients are being treated in primary care, but the majority of studies of intensive treatment of patients

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Motivational interviewing (Miller and Rollnick [1]) has been used as a promising intervention strategy in several contexts, e.g. alcohol abuse, drug addiction, smoking cessation, weight loss, adherence to treatment and follow-up, increase of physical activity, asthma treatment, and diabetes treatment [2].

This study reports a statistically significant effect of motivational interviewing on patients':

- understanding of the disease;
- beliefs regarding treatment and prevention aspects;
- motivation for changing behaviour.

with type 2 diabetes have been performed in hospital settings and without the use of MI [3–6]. A previous study showed that a course in MI can influence the GP's professional behaviour towards using the method in general practice [7]. Our study aims to evaluate whether MI has beneficial effects if added to intensive poly-pharmacy treatment of type 2 diabetic patients detected by screening. Can MI over one year improve type 2 diabetic patients' (1) understanding of type 2 diabetes, (2) their beliefs regarding prevention and treatment, and (3) their motivation for behaviour change?

Material and methods

Study group

This randomized controlled trial is a sub-study of the ADDITION study [8], which is a multi-centre randomized controlled trial of a target-driven approach to intensive treatment of patients with type 2 diabetes detected by screening, aged 40–69 years. Inclusion and exclusion criteria followed the ADDITION study [8].

This study included practices/GPs from two counties in Denmark (Figure 1) randomized by the project manager using the method "drawing lots" into *an intervention group* (*I-group*) comprising GPs who completed a MI training course and *a control group* (*C-group*) of GPs who received no formal training in MI.

Randomization was stratified by county and size of practices and no blinding was used. In order to determine sample size, a power analysis was performed [9]. The inclusion and dropouts of the GPs and patients is shown in the flowchart in Figure 1.

Method of intervention

The courses in "Motivational interviewing" (MI) for the GPs in the I-group were conducted by a trained teacher introducing a manual [10], which, together with "Motivational interviewing, preparing people to change addictive behaviour" [1], constituted the theoretical part of the course curriculum. The I-group was coached in the key points of MI (Figure 2) [1]. The training also included the use of specific skills e.g. empowerment [11], ambivalence [1], the decisional balance schedule [1], the visual analogue scale [1], stage of change [12] and reflective listening [1], all of which are described in detail in the book MI [1].

The I-group courses consisted of a 1½-day training course with a ½-day follow-up twice during the first year. None of the GPs in the I- and the C-group

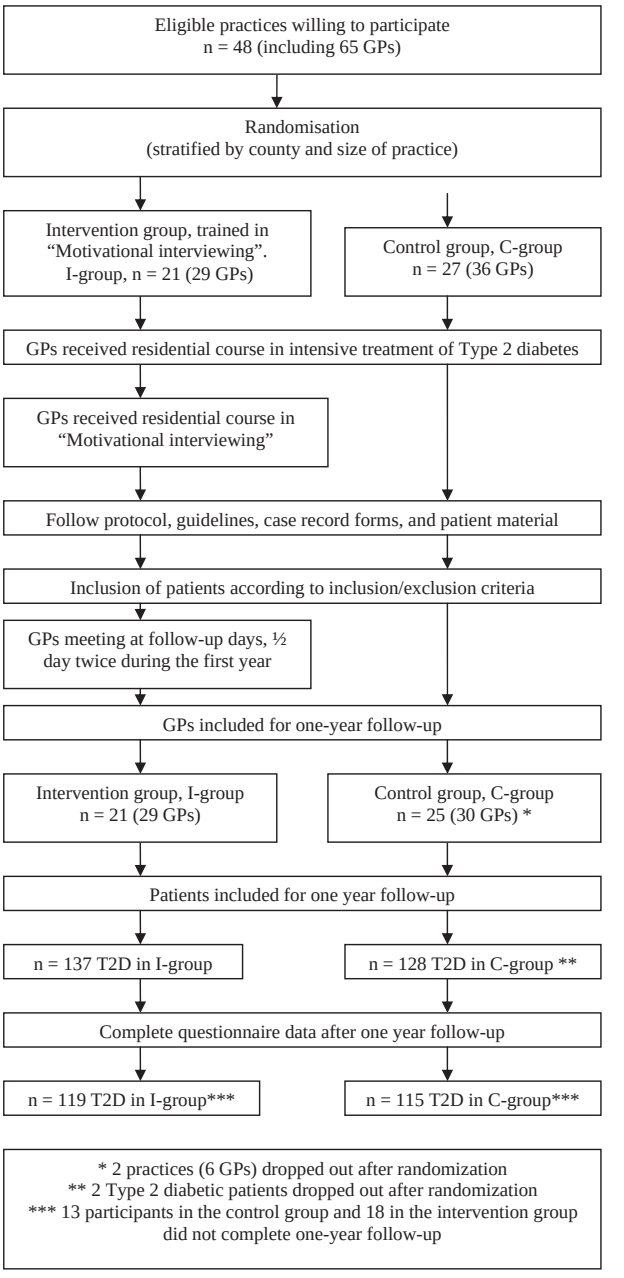

Figure 1. Flowchart of included general practitioners (GPs) and screen-detected Type 2 diabetic patients (T2D).

"Motivational interviewing" is based on a characteristic counselling style including different techniques used in the patient–doctor relationship. The examination and resolution of ambivalence is the central purpose in non-directive counselling. "Motivational interviewing" is a particularly way of helping clients recognize problems and change their behaviour accordingly. The spirit and characteristics of "Motivational interviewing" are captured in the following key points.

1. Motivation to change is elicited from the client, and not imposed from without. "Motivational interviewing" relies on identifying and mobilizing the client's intrinsic values and goals to stimulate behaviour change.
2. The counselling style is generally facilitating through eliciting patients' views, thereby guiding the patient towards the common goals chosen by the patient and counsellor.
3. Readiness to change is not a client trait, but a fluctuating product of interpersonal interaction. Resistance and "denial" are seen not as client traits but as feedback regarding counsellor behaviour. Client resistance is often a signal that the counsellor is assuming greater readiness to change than is the case, and it is a cue that the counsellor needs to modify motivational strategies.
4. Ambivalence takes the form of a conflict between two courses of action (e.g. indulgence versus restraint), each of which has perceived benefits and costs associated with it. The counsellor's task is to facilitate expression of both sides of the ambivalence impasse, and guide the client toward an acceptable resolution that triggers change. The specific strategies of "Motivational interviewing" are designed to elicit, clarify, and resolve ambivalence in a client-centred and respectful counselling atmosphere.
5. Eliciting and reinforcing the clients in their motivational behaviour towards problem recognition, concerns, desire, intention, responsibility, and ability to change. The client's belief in the ability to carry out and succeed in achieving a specific goal is essential.
6. "Motivational interviewing" is not merely a set of techniques that are applied in treatment of clients. It is an interpersonal style, not restricted to formal counselling settings. It is a subtle balance of directive and client-centred components shaped by a guiding philosophy and understanding of what triggers change.
7. The therapeutic relationship is more like a partnership or companionship than expert/recipient roles. The counsellor respects the client's autonomy and freedom of choice and consequences regarding his or her own behaviour.

Figure 2. Description of "motivational interviewing".

had previously participated in an MI course. All GPs in the I- and the C-group participated in the same ½-day course on intensive treatment of type 2 diabetes.

Measurements

The assessment questionnaire mainly consisted of a collection of previously validated questionnaires used in primary care and on type 2 diabetic patients:

- Health Care Climates Questionnaire (six items) [13–15]. This assesses the patient's perception of the patient–doctor relationship and the degree to which counselling is autonomously supportive as opposed to controlling. There were seven categories from "not at all true" to "very true".
- Treatment Self-Regulation Questionnaire [15,16]. This assesses the degree to which behaviour tends to be self-determined. The main scale includes three subscales: the "autonomous" regulatory style; the "controlled regulatory" style; and "amotivation" style. It included 21 items with seven answer categories from "not at all true" to "very true".
- Diabetes Illness Representation Questionnaire [17,18]. This assesses type 2 diabetes patients' beliefs and understanding of type 2 diabetes, and involves different subscales: *timeline* (patient's perception of duration of the illness); *threat and impact, i.e. consequences* (patient's expected outcome of the illness); and *prevention and control* (patient's beliefs of the curability of the disease, in which way prevention is possible and how good recommended treatments are at controlling the illness). All questions have five answer categories ranging from "no importance" to "extremely important". It included 30 items.
- Summary of Diabetes Self-Care Activities [19;20]. This assesses the extent to which type 2 diabetic patients perform on various self-care activities related to type 2 diabetes. The answer categories were either listed on a dichotomous (yes/no) or on a continuous scale with seven answering categories (from "always" to "never"). It included 13 items.

Sum scores were calculated for the questionnaires "Health Care Climates Questionnaire", "Treatment Self-Regulation Questionnaire", and "Diabetes Illness Representation Questionnaire" [15–18,21–23]. The results of "Summary of Diabetes Self-Care Activities" are given as percentages. The method of sum-scoring questions has been used and validated in different settings [15–18,21–23].

Questionnaires were mailed to all patients in both groups of GPs 12 months after inclusion. One reminder was sent to the "no response" cases within four weeks. The questionnaires were designed and processed in Teleform.

Statistical method

Statistical analysis of data was conducted in SPSS. All single variables were analysed by the non-parametric

Mann–Whitney test. All sum score variables were analysed by t-test.

Results

In all, 48 practices (65 GPs) were included (see Flowchart, Figure 1). All GPs in the I-group participated in the MI course, and only very few (less than 6%) were absent from the ½-day follow-up meetings. Our study included 265 type 2 diabetic patients: 128 in the C-group and 137 in the I-group. The response rate to the patient questionnaire was 87% in the I-group, and 90% in the C-group at the one year follow-up. No significant differences in the demographic distribution at baseline were found between the I-group and C-group (age, sex, socio-economic status).

The sum scores for the "Health Care Climates Questionnaire" and "Treatment Self-Regulation Questionnaire" at one year are presented in Table I. Patients from the I-group were significantly more autonomous in their choice of action towards behavioural changes and more motivated to change behaviour than patients from the C-group.

Table II features the patients' impression of the advice they had received from their GP regarding diet, exercise, and self-control of diabetes after one year. These data show that patients in the I-group reported having received significantly more specific advice from their GP compared with the C-group. Furthermore, self-care activities regarding changing smoking and alcohol habits after one year are shown in Table II. In the I-group only 1.2% (16 patients) and in the C-group 1.6% (22 patients) had a level of alcohol consumption above the recommendations from the Danish Board of Health treatment goals. With regard to smoking cessation, patients in the I-group received significantly more counselling compared with the C-group.

Table III shows changes in patients' beliefs regarding their diabetes after one year. Patients in the I-group were significantly more aware of the importance of controlling their diabetes for specific factors than patients in the C-group.

Discussion

Statement of principal findings

After one year, the patients in the I-group became more motivated and more autonomous towards behavioural changes than the patients in the C-group. Furthermore, the I-group reported a better understanding as to which factors would help prevent complications and ensure relevant disease control. The autonomous style represents the most self-determined form of motivation and has consistently been associated with behavioural change and positive healthcare outcomes [15,16]. Another study showed that guided self-determination with increased autonomy was effective in improving life skills with diabetes [24]. This study suggests that MI facilitates more patients entering the contemplation phase in the I-group than in the C-group, and that the I-group patients were more motivated to change behaviour.

Strengths and weaknesses of the study

We randomized at practice level in order to avoid contamination between the intervention and control group [25]. We included 48 practices in two counties, and performed stratified randomization of GPs on size of practice and on county. We consequently anticipated a high internal validity, a low degree of selection bias and a random allocation of unpredictable confounders. The validity of the study is strengthened by a high response rate to the questionnaire. The number of GPs and patients

Table I. Health Care Climate Questionnaire (HCCQ) and Treatment Self-Regulation Questionnaire (TSRQ) evaluated at one year.

Sum score	I-group mean	C-group mean	△; (95 CI); p-value	Interpretation of results
HCCQ sum	5.89	5.68	0.19 (−0.14;0.52) 0.26	Patients in both groups were satisfied with their relationship with the GP and the GP's counselling style
TSRQ control	4.95	4.88	0.06 (−0.31;0.43) 0.75	Patients in both groups tended to seek leadership and controlled counselling
TSRQ autonomy	6.50	6.24	0.21 (0.01;0.41) 0.03	Patients in the I-group were more autonomous, i.e. more self-determined and motivated for behavioural change
TSRQ amotivation	2.88	3.43	−0.53 (−0.94; −0.11) 0.014	Patients in the C-group were more amotivated, i.e. patients in the I-group were more motivated for behavioural change
TSRQ relative autonomic-control index	1.51	1.40	0.08 (−0.08;0.23) 0.34	TSRQ index relates how much self-determination the patients had in relation to how much control/back-up the patients needed. The index did not change statistically significantly between groups

Notes: Sum scores of sub-questions–answers on a seven-item scale, 1 = totally disagree to 7 = fully agree. C-group: Control group of GPs (n for patients = 115), I-group: Intervention group of GPs trained in motivational interviewing (n for patients = 119).

Table II. Advice giving by the general practitioner to the patient and patients' self-care activities regarding smoking and alcohol evaluated at one year.*

Advice given by the GP	I-group %	C-group %	I-group vs. C-group p-value
Follow a low-fat eating plan	95.6	87.1	0.025
Follow a complex carbohydrate diet	56.9	41.1	0.01
Reduce the number of calories	81.8	69.4	0.027
Eat lots of food high in dietary fibre	70.8	50.5	0.002
Eat lots (at least five servings per day) of fruits and vegetables	82.5	71.0	0.037
Eat very few sweets, e.g. desserts	78.8	73.4	0.34
You have not been given any advice about your diet	2.9	6.9	0.79
Get low-level exercise (such as walking) on a daily basis	89.1	87.1	0.70
Exercise continuously for a least 20 minutes at least three times a week	38.7	25.8	0.034
Fit exercise into your daily routine	75.2	61.3	0.017
Engage in a specific amount, type, duration, and level of exercise	23.4	8.9	0.002
You have not been given any advice about exercise	4.4	8.4	0.61
Test your blood glucose (sugar) using a drop of blood from finger	60.6	46.8	0.034
Test your blood glucose using a machine to read the results	51.8	34.7	0.006
Test your urine for sugar	30.7	13.7	0.002
You have not been given any advice about testing for glucose	29.2	42.7	0.027
Smoking measurements:			
Number of smokers (% of total number of patients)	39.5%	31.3%	0.21
How many cigarettes do you smoke on average per day?	13.2	11.1	0.27
At your last visit to the doctor, did anyone ask about your smoking status? (YES, n/*n*)	43% (20/47)	19% (7/36)	0.001
At your last visit to the doctor, did anyone counsel you about stopping smoking or refer you to a stop-smoking programme? (Yes, n/*n*)	43% (20/47)	27% (10/36)	0.046
How motivated are you to stop smoking? (scale: 1 = highly, 2 = to a certain degree, 3 = neither/nor, 4 = to a limited degree, 5 = not at all)	2.42	2.33	0.73
Alcohol measurements:			
How many beers do you drink on average per week?	2.10	3.98	0.27
How many glasses of wine do you drink on average per week?	1.97	2.60	0.24
In consideration to your health, do you believe that you should lower your alcohol intake? (Yes, n/*n*)	79% (108/137)	82% (105/128)	0.27

Notes: *Diabetes Self-Care Activities Questionnaire. Data regarding smoking were analysed according only to smokers, whereas data regarding alcohol intake was analysed on all patients. C-group: Control group of GPs (n for patients = 115), smokers among patients (n = 36), I-group: Intervention group of GPs trained in motivational interviewing (n for patients = 119), smokers among patients (n = 47).

that dropped out of the study after randomization is not expected to bias the results in consideration of the total number of GPs and patients included in this study.

A limitation of the study is not having baseline data. Our study included only newly diagnosed diabetes patients, who naturally have "no change" or "no statements regarding diabetes" to report at

Table III. Patients' views on timeline, control, prevention, threat, and impact of diabetes evaluated at one year by the Diabetes Illness Representation Questionnaire.

Sum score	I-group mean	C-group mean	Δ; (95 CI); p-value
Timeline (patient's perception of duration of the illness)	2.41	2.43	−0.04 (−0.23;0.15) 0.70
Control (patient's beliefs about how good recommended treatments are at controlling the illness)	3.90	3.68	0.22 (0.04;0.39) 0.016
Prevention (patient's beliefs about the extent to which the illness is amenable to cure and in which way prevention is possible)	4.16	3.99	0.17 (0.01;0.32) 0.042
Threat (patient's expected outcome of the illness)	2.61	2.58	0.02 (−0.09; −0.12) 0.67
Impact (patient's expected impact on day-to-day life and in the long term)	3.50	3.47	0.02 (−0.12;0.18) 0.70

Notes: Sum scores on a five-item scale: 1 = no importance to 5 = extremely important. C-group: Control group of GPs (n for patients = 115), I-group: Intervention group of GPs trained in motivational interviewing (n for patients = 119).

baseline. We used questionnaires to monitor different aspects of change in our diabetic patients. Therefore our study had no baseline data included.

The study did not include blinding of behavioural changes and may therefore be influenced by the Hawthorne effect [26]. However, both groups of patients in this study were treated by GPs trained to give intensive diabetes treatment, but only one group was further exposed to training in motivational interviewing. A potential Hawthorne effect thus existed in both treatment groups.

During the intensive diabetes management training, it was stressed that GPs should act as counsellors for the patients, allowing treatment decisions to be based on mutual understanding between the patient and the GP. This would tend to diminish possible differences between groups [7]. Furthermore, the intervention itself and inclusion in a study may have increased the patient's consciousness of lifestyle behaviour in both groups, and thereby reduced the effect of MI [7]. In addition to this, a potential effect of the study was dependent on whether the patients appeared at the consultation encounters [27]. Finally, this study may be limited by the fact that training in MI was performed by one person's teaching methods and capacity to train the GPs [7]. However, we have previously shown that GPs in the I-group adhered more to the methods of MI than GPs in the C-group [7].

Strength and weakness in relation to other studies, meaning of the study, unanswered questions, and future research

It was an unexpected finding that GPs in the I-group gave patients more advice on diet, exercise, and self-control of diabetes than GPs in the C-group. A study with similar set-up reported that patients became more satisfied by their GP's counselling style but with no effect on perceived advice or the risk profile [28]. The authors suggested that GPs became too focused on the consultation process at the expense of disease management [28]. Our interpretation of the results in this paper is that GPs in the I-group used MI to increase patients' awareness of the need for behavioural changes in lifestyle and adherence to diabetes prevention and treatment. This is also supported when correlating with smoking cessation, where patients from the I-group received significantly more counselling than the C-group. However, patients in both the I-group and the C-group were equally motivated to stop smoking.

With regard to the lack of change in alcohol intake behaviour, the results revealed that more than 98% of the patients in both groups were, in fact, within the treatment goals, which left only little room for demonstrating the effect of MI. However, the same fact indicates that all patients in both groups was very aware of the potential effect of alcohol prevention, which was probably due to the intensive diabetic counselling rather than to MI.

Regarding counselling on the patients' understanding of factors preventing complications and controlling the disease, the GPs had a significant impact on patients in the I-group. This increased awareness may be the result of facilitating patients' acceptance of the disease and an interest in knowing about preventing complications through lifestyle behavioural changes and adherence to medication [29]. The differences obtained were small in a clinical context; all did, however, point in the direction of more motivation. Overall, there is a need for further investigation of the potential effect of MI on diabetic patients' motivation, self-management behaviour, and health outcomes [30].

Conclusion

This study reports a significant effect of MI on patients' understanding of diabetes, of beliefs regarding treatment aspects, and of their motivation for behaviour change. Whether these results can be sustained long term and whether the results will become clinically relevant in terms of changes in risk profile has yet to be investigated.

Ethical aspects

The study was approved by the Committee on Biomedical Research Ethics and by the Danish Data Protection Agency in terms of conducting the study within the rules of data safety and research ethics.

It is confirmed that all patient/personal identifiers have been removed or disguised so the patient/person(s) described are not identifiable and cannot be identified through the details of the story.

Competing interests

There are no competing interests of any kind.

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References

[1] Miller WR, Rollnick S. Motivational interviewing, preparing people to change addictive behavior. 2nd ed. New York: Guilford Press.

[2] Rubak S, Sandbaek A, Lauritzen T, Christensen B. Motivational interviewing: A systematic review and meta-analysis. Brit J Gen Pract 2005;55:305–13.

[3] Gaede P, Lund-Andersen H, Parving HH, Pedersen O. Effect of a multifactorial intervention on mortality in type 2 diabetes. N Engl J Med 2008;358:580–91.

[4] Pyorala K, Pedersen TR, Kjekshus J, Faergeman O, Olsson AG, Thorgeirsson G. Cholesterol lowering with simvastatin improves prognosis of diabetic patients with coronary heart disease. A subgroup analysis of the Scandinavian Simvastatin Survival Study (4S). Diabetes Care 1997;20:614–20.

[5] Gerstein HC, Yusuf S, Mann JFE, Hoogwerf B, Zinman B, Held C, et al. Effects of ramipril on cardiovascular and microvascular outcomes in people with diabetes mellitus: \results of the HOPE study and MICRO-HOPE substudy. Heart Outcomes Prevention Evaluation Study Investigators. Lancet 2000;355:253–9.

[6] Turner RC, Holman RR, Stratton IM, Cull CA, Matthews DR, Manley SE, et al. UKPDS 28: A randomized trial of efficacy of early addition of metformin in sulfonylurea-treated type 2 diabetes. UK Prospective Diabetes Study Group. Diabetes Care 1998;21:87–92.

[7] Rubak S, Sandbaek A, Lauritzen T, Borch-Johnsen K, Christensen B. An education and training course in "Motivational Interviewing" influence GPs' professional behaviour. ADDITION Denmark. Brit J Gen Pract 2006;56: 429–36.

[8] Lauritzen T, Griffin S, Borch-Johnsen K, Wareham NJ, Wolffenbuttel BH, Rutten G. The ADDITION study: Proposed trial of the cost-effectiveness of an intensive multifactorial intervention on morbidity and mortality among people with Type 2 diabetes detected by screening. Int J Obes Relat Metab Disord 2000;24:6–11.

[9] Rubak S. Motivational interviewing in intensive treatment of Type 2 diabetes detected by screening in general practice: Overall effect of a course in "Motivational interviewing". PhD Dissertation, University of Aarhus, Institute of Public Health, Department of General Practice, Denmark; 2005.

[10] Mabeck CE, Kallerup H, Maunsbach M, DSAM. Motivational interviewing. Copenhagen: Danish Association of Doctors, Copenhagen, DSAM; 2001.

[11] Feste C, Anderson RM. Empowerment: from philosophy to practice. Patient Educ Couns 1995;26:139–44.

[12] Prochaska JO, DiClemente CC. Transtheoretical therapy: Toward a more integrative model of change. Psychotherapy: Theory, Research and Practice 1982;19:276–88.

[13] Deci EL, Ryan RM. Intrinsic motivation and self-determination in human behavior, 1st edn. New York: Plenum Books; 1985.

[14] Williams GC, Freedman ZR, Deci EL. Supporting autonomy to motivate patients with diabetes for glucose control. Diabetes Care 1998;21:1644–51.

[15] Williams GC, McGregor HA, Zeldman A, Freedman ZR, Deci EL. Testing a self-determination theory process model for promoting glycemic control through diabetes self-management. Health Psychol 2004;23:58–66.

[16] Pelletier LG, Tuson KM, Haddad NK. Client Motivation for Therapy scale: A measure of intrinsic motivation, extrinsic motivation, and amotivation for therapy. J Pers Assess 1997;68:414–35.

[17] Lawson VL, Bundy C, Lyne PA, Harvey JN. Using the IPQ and PMDI to predict regular diabetes care-seeking among patients with Type 1 diabetes. Br J Health Psychol 2004;9: 241–52.

[18] Skinner TC, Howells L, Greene S, Edgar K, McEvilly A, Johansson A. Development, reliability and validity of the Diabetes Illness Representations Questionnaire: Four studies with adolescents. Diabet Med 2003;20:283–9.

[19] Glasgow RE, Toobert DJ, Hampson SE, Strycker LA. Implementation, generalization and long-term results of the "choosing well" diabetes self-management intervention. Patient Educ Couns 2002;48:115–22.

[20] Toobert DJ, Hampson SE, Glasgow RE. The summary of diabetes self-care activities measure: Results from 7 studies and a revised scale. Diabetes Care 2000;23:943–50.

[21] Ryan RM, Connell JP. Perceived locus of causality and internalization: Examining reasons for acting in two domains. J Pers Soc Psychol 1989;57:749–61.

[22] Skinner TC, Hampson SE. Personal models of diabetes in relation to self-care, well-being, and glycemic control: A prospective study in adolescence. Diabetes Care 2001; 24:828–33.

[23] McIver JP, Carmins EG. Unidimensional scaling, 2nd edn. Beverly Hills: Sage Publications; 1982.

[24] Zoffmann V, Lauritzen T. Guided self-determination improves life skills with Type 1 diabetes and A1C in randomized controlled trial. Patient Educ Couns 2006;64:78–86.

[25] Kerry SM, Bland JM. Analysis of a trial randomised in clusters. BMJ 1998;316:54.

[26] Fletcher RH, Fletcher SW, Wagner EH. Clinical epidemiology, the essentials. 3rd ed. Baltimore, Maryland, USA: Williams & Wilkins; 1996.

[27] Rubak S, Sandbaek A, Lauritzen T, Borch-Johnsen K, Christensen B. Effect of "Motivational interviewing" on quality of care measures in screen detected Type-2-diabetes patients: A one year follow-up of an RCT. ADDITION Denmark. Prepared for publication; 2009.

[28] Kinmonth AL, Woodcock A, Griffin S, Spiegal N, Campbell MJ. Randomised controlled trial of patient centred care of diabetes in general practice: Impact on current wellbeing and future disease risk. The Diabetes Care From Diagnosis Research Team. BMJ 1998;317:1202–8.

[29] Jallinoja P, Absetz P, Kuronen R, Nissinen A, Talja M, Uutela A, et al. The dilemma of patient responsibility for lifestyle change: Perceptions among primary care physicians and nurses. Scand J Prim Health Care 2007;25:244–9.

[30] Poskiparta M, Kasila K, Kiuru P. Dietary and physical activity counselling on type 2 diabetes and impaired glucose tolerance by physicians and nurses in primary healthcare in Finland. Scand J Prim Health Care 2006;24:206–10.