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Perceived susceptibility to COVID-19 infection and narcissistic traits☆

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ABSTRACT

People's perceived susceptibility to illnesses plays a key role in determining whether or not to take protective measures. However, self-enhancing biases hinder accurate susceptibility perceptions, leaving some individuals to feel invulnerable in the face of acute health risks. Since such biases are prominent characteristics of individuals with narcissistic personality traits, this article empirically examined whether low perceived susceptibility of infection with COVID-19 is related to subclinical narcissism, as measured with the Narcissistic Personality Inventory (NPI-16) and the Narcissism Admiration and Rivalry Questionnaire (NARQ). We report the findings from a worldwide sample ($N = 244$), a UK sample before governmental pandemic restrictions ($N = 261$), a UK sample after restrictions ($N = 261$) and a pooled data analysis ($N = 766$). Overall, grandiose narcissism as measured with the NPI-16 predicted lower perceived susceptibility of infection, also after controlling for age and gender, whereas the NARQ Admiration subscale predicted higher perceived susceptibility. The findings are discussed in the light of theoretical and policy implications.

1. Introduction

In March 2020, the World Health Organization announced that the number of infections with the new coronavirus COVID-19 has reached the status of a pandemic. Health experts have suggested several guidelines to curb the rapid spreading of infections, such as regular hand washing and staying away from crowded places (Chu et al., 2020). However, reactions of the public varied greatly, from denial of the severity, to panic toilet paper buying (e.g., Ortega & Orsini, 2020; Prentice, Chen, & Stantic, 2020). To explain these varied reactions, we can resort to prominent models in psychology, such as the Health Belief Model (e.g., Champion & Skinner, 2008; Rosenstock, 1974) and Protection Motivation Theory (Rogers, 1975). Both stipulate that an individuals' perceived susceptibility to a health threat plays a key role in willingness to engage in preventive health behaviours (Floyd, Prentice-Dunn, & Rogers, 2000; Janz & Becker, 1984). Moreover, people who believe themselves not susceptible for a disease are more likely to dismiss or ignore information and recommended guidelines (Ahn, Park, & Haley, 2014; Jaccard, Dodge, & Guilamo-Ramos, 2005). Therefore, susceptibility perceptions are important to examine — and the question *who* has low risk perceptions becomes imperative.

Decades of research have demonstrated that there are certain cognitive biases that influence people's perceived susceptibility, resulting in a larger gap between perceived and actual health risk (Klein & Stefanek, 2007; Klein & Weinstein, 1997). In particular, the optimism bias (i.e., the tendency to underestimate the likelihood of negative events happening to oneself; Weinstein, 1987) and downward social comparison tendencies (i.e., a tendency to compare oneself to individuals who are worse-off; Festinger, 1954) have been shown to reduce one's perceived susceptibility to negative health outcomes (e.g., Clarke, Lovegrove, Williams, & Machperson, 2000; Miles & Scaife, 2003; Perloff & Fetzer, 1986). Since these biases are prominent characteristics of individuals with narcissistic personality traits (Farwell & Wohlwend-Lloyd, 1998; Ohmann & Burgmer, 2016), this article sought to empirically examine whether low perceived risk of becoming infected with COVID-19 is related to (subclinical) narcissism.

1.1. Perceived susceptibility

Perceived susceptibility reflects the *subjective risk* of contracting an illness or finding oneself in a situation with a negative health outcome, for example, having cavities or breaking a leg. These perceptions can range from flat out denial of any possibility of contracting a disease or negative health outcome, to acknowledging there is a statistical risk, to feeling that it is only a matter of time (Rosenstock, 1974). Given the importance of perceived susceptibility on regular health protection

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behaviours (i.e., taking prescribed medication, or wearing face masks; Janz & Becker, 1984; Sim, Moey, & Tan, 2014), it may come as no surprise that health psychologists have shown great interest in this construct in times of epidemics (Leppin & Aro, 2009). For example, during the SARS epidemic in 2003, it was found that Chinese citizens with low perceived susceptibility to infection with SARS engaged significantly less in personal hygiene practices (i.e., hand sanitation, sneezing in elbow and the wearing of face masks; Tang & Wong, 2003). Recent research replicated these findings in the light of the COVID-19 pandemic (e.g., Abdelrahman, 2020; Jose et al., 2020; Wong, Alias, Wong, Lee, & AbuBakar, 2020). Moreover, low perceived susceptibility to infection with the coronavirus has been indicative of low support for imposed rules by official authorities (De Coninck, d'Haenens, & Matthijs, 2020). When people do not perceive themselves at risk of becoming ill, they are less likely to take precautions, endangering not only themselves but also others.

1.2. Biases in perceived susceptibility

There are several factors that influence people's perceived susceptibility to illnesses, but surprisingly, objective vulnerability (i.e., scientifically estimated risk factors) only plays a minor role. For example, smokers estimated their likelihood to get lung cancer only slightly higher than non-smokers did; however, both smokers and non-smokers underestimated their actual risk (McKenna, Warburton, & Winwood, 1993; van der Pligt, 1998). In fact, most people display a general tendency to believe that negative events, such as becoming ill, or being involved in an accident, are more likely to happen to other people than to themselves (Klein & Weinstein, 1997; Sharot, 2011). This phenomenon, termed the optimism bias, or unrealistic optimism, has proven difficult to overcome (e.g., Weinstein & Klein, 1995). For example, in a study where people reported their perceived susceptibility to various negative (health) outcomes, researchers found that people only updated their risk estimations when presented with favourable objective risk information, but not when the information showed that they were more at risk than they thought (Sharot, Korn, & Dolan, 2011). While this positive outlook can be beneficial in the sense that it serves as a coping mechanism preventing people from excessive worrying about all potential dangers (e.g., Moritz & Jelinek, 2009), it becomes problematic when preventive health behaviours are deemed as unnecessary.

When asked to assess one's susceptibility to a particular illness, a stereotypical image of a high risk-group may come to mind (Davidai & Gilovich, 2016; Weinstein, 1980; Weinstein & Klein, 1995). This sets a process of social comparison in motion, assessing how similar or dissimilar this stereotype is to oneself (Wood, 1996). However, the accuracy of these inferences can be impaired by self-enhancement motives. For example, elderly UK residents who did not *identify* as old and frail were less likely to adhere to the governments' Heat Protection Plans to prevent elderly from dehydration and consequences of overheating, even though they were considered at risk objectively (i.e., based on age and medical conditions; Abrahamson et al., 2009). This example illustrates how pride and protecting one's self-integrity (i.e., a refusal to identify with the stereotypical image of weak and dependent on others for safety, Hughes et al., 2008; Aminzadeh & Edwards, 2000) can play a role in shaping a persons' perceived susceptibility through social comparison (Taylor & Lobel, 1989). In fact, both the tendency to engage in downward social comparisons (i.e., concluding that the person who is worse off is dissimilar to oneself) and displays of the optimism bias are considered a means to reinstall a positive view of oneself when it is under threat (see also Sherman & Cohen, 2006; Rogers, 2006). Hence, for most people these biases will play up primarily in situations that threaten their positive self-image (Lynch & VanDellen, 2020), such as when receiving a harsh performance review at work. However, individuals with strong narcissistic traits are not only motivated to reinstall a positive view of themselves when threatened; they proactively seek out opportunities to boost grandiose views of themselves (Grapsas, Brummelman, Back, & Denissen, 2020). Therefore, in the current article, we relate an important social outcome — perceived susceptibility in the context of the corona pandemic, to a prominent individual difference variable — narcissism.

1.3. Narcissism

Narcissism is characterized by a disproportioned sense of self-importance combined with a disdain for others and their needs (Krizan & Bushman, 2011). Narcissistic individuals perceive themselves as better looking, more intelligent, better leaders, and as more creative than others (Grijalva & Zhang, 2016). In its extreme form narcissism is a personality disorder, which is often only diagnosed when the individual seeks help for comorbidities such as depression or anxiety disorders (Caligor, Levy, & Yeomans, 2015). When narcissistic individuals are aware of their narcissistic tendencies, they see it as helping them 'get ahead', instead of as problematic (Carlson & Khafagy, 2018). Official diagnoses of pathological narcissism are thus relatively rare, but it has been suggested that narcissistic traits have become widespread in our modern society that values assertiveness, self-esteem, agency, and extraversion (Twenge, Konrath, Foster, Keith Campbell, & Bushman, 2008; Santos, Varnum, & Grossmann, 2017; cf. Roberts, Edmonds, & Grijalva, 2010; Wetzel et al., 2017). In fact, most of what is known about narcissism is derived from studies that focus on narcissistic traits in the general population. The Narcissistic Personality Inventory (NPI; Raskin & Hall, 1979) is the most widely used measure of grandiose narcissism (Foster, Shenesey, & Goff, 2009). The NPI is derived from the criteria for the official clinical narcissism diagnosis, and consequently places clinical and subclinical narcissism on a spectrum (Krizan, 2018). One important finding in light of the current article, is that grandiose narcissism is positively related to engagement in risk-taking behaviours, for example, substance use (Hill, 2016; Welker, Simons, & Simons, 2019), risky driving (Bushman, Steffgen, Kerwin, Whitlock, & Weisenberger, 2018), unprotected sex (Coleman, Bernstein, Benfield, & Smyth, 2020), gambling (Lakey, Rose, Campbell, & Goodie, 2008) and expressing deviant opinions (Buelow & Brunell, 2014).

Grandiose narcissistic traits appear to coincide with cognitive biases that may leave the individual feeling invincible in the face of risk (Giacomin, 2019; Lakey et al., 2008). Individuals with strong grandiose narcissism traits (henceforth called narcissistic individuals) are known to display the optimism bias more than individuals with weaker or no grandiose narcissism traits. Narcissistic individuals consistently estimated negative events, such as developing a stomach ulcer or going blind, more likely to happen to other people than to themselves, and positive events, such as winning the lottery or receiving a promotion, as more likely to happen to themselves than others (e.g., Tamborski, Brown, & Chowning, 2012; Robins & Beer, 2001; Farwell & Wohlwend-Lloyd, 1998). Moreover, because of their need to feel unique, narcissistic individuals also tend to focus more on differences than on similarities when engaging in social comparisons (Ohmann & Burgmer, 2016; Farwell & Wohlwend-Lloyd, 1998). So, while there is evidence that narcissistic individuals seem predisposed to the same cognitive biases that influence perceived susceptibility to diseases, to date it is unknown whether narcissists' sense of invulnerability extends beyond behaviours related to thrill-seeking and social status (Krizan, 2018). The current study is one of the first to investigate whether narcissistic personality traits are also related to perceived insusceptibility to diseases, in this case infection with the coronavirus COVID-19.

1.4. Current studies

Perceived susceptibility to infection with the coronavirus COVID-19 has been shown to be an important predictor of preventive health behaviours that contain the spreading of infections (e.g., Dryhurst et al., 2020). Building on the notion that grandiose narcissism is related to self-enhancement tendencies including unrealistic optimism and downward

social comparisons, we expected that perceived susceptibility to infection with COVID-19 is lower in individuals with stronger grandiose narcissistic traits.

Grandiose narcissism is typically measured with the NPI (Raskin & Hall, 1979); however contemporary insights proposed that grandiose narcissism can be further divided in two subtypes with distinct self-regulation strategies to maintain a grandiose self-concept: self-promotion (Admiration) and self-defence (Rivalry) as measured with the NARQ (Narcissism Admiration and Rivalry Questionnaire; e.g., Back et al., 2013; Back, 2018). To expedite knowledge of narcissistic influences on perceived susceptibility to infection, we use both measurements. We test the hypothesis that individuals with stronger grandiose narcissistic traits will feel less at risk of infection with the coronavirus COVID-19 in three samples: a worldwide sample (Study 1), a UK sample before (Study 2), and after (Study 3) governmental restrictions were implemented, including the closing of schools and cancellation of public events.

2. Study 1

2.1. Method

2.1.1. Procedure

Study 1 was conducted on March 15, four days after the WHO declared COVID-19 as a pandemic. The study was preregistered at https://aspredicted.org/blind.php?x=x7qn28. Participants ($N = 255$) were recruited on Prolific Academic (www.prolific.co). Participants gave their informed consent and provided their age, gender, education level, and country of residence. Then they filled out the narcissism measures. The order of the NARQ and NPI-16 was counterbalanced, such that half of the participants first filled out the NARQ followed by the NPI-16 and vice versa. Participants' data were only analysed if they passed an attention check (i.e., *To show that you are reading the statements seriously please select the first option* "*Not agree at all*") that was hidden in the NARQ. They then answered questions regarding their perceived susceptibility and protective behaviours.[1] Finally, participants were asked whether they had been tested for infection with the coronavirus – and what the result was – and were prompted to leave any comments regarding their thoughts on the virus. The payment was £1.25.

2.1.2. Participants

Two hundred and forty-four participants (41.0% female, 57.0% male, and 2.0% non-binary) passed the attention check. They had a mean age of 26.71 ($SD = 7.61$). Participants originated from 24 different countries; the majority (23.4%) resided in the UK and Northern Ireland, followed by Portugal (17.2%) and Poland (15.6%). To give an impression of the perceived risk as estimated by governments, public transport was still in use in most of the represented countries at the moment of data collection, with the exception of Italy and Spain (Hale, Webster, Petherick, Phillips, & Kira, 2020). Only one participant had been tested on the coronavirus; the result of the test was negative.

2.1.3. Measures

2.1.3.1. Perceived susceptibility. Perceived susceptibility was measured with three items: "The risk that I will be infected with the coronavirus (COVID-19) is…", "Compared to other people my age, the likelihood that I will be infected with the coronavirus (COVID-19) is…", and "Compared to other people in my neighbourhood the likelihood that I will be infected with the coronavirus (COVID-19) is…". All questions were answered on a 5- point Likert scale (1 = *Very low/Not at all* to 5 = *Very high/Very much*), $\alpha = 0.86$.

2.1.3.2. Narcissistic Personality Inventory-16 (NPI-16). Grandiose narcissism was measured with the short version of the NPI, the NPI-16 (Ames, Rose, & Anderson, 2006). Participants responded to 16 forced-choice items by selecting the option they identify with the most. For each item, one option is more narcissistic than the other (e.g., "I think I am a special person" is more narcissistic than "I am no better or worse than most people"). Narcissistic statements were coded as 1 and neutral statements as 0. The variable NPI-16 is composed of the summed score across all 16 items, $\alpha = 0.74$.

2.1.3.3. Narcissistic Admiration and Rivalry Questionnaire (NARQ). Grandiose narcissism as specified by self-enhancement strategies was measured with the NARQ (Back et al., 2013). Participants were asked to rate 18 statements on the extent to which they applied to them on a 6-point Likert scale (1 = *not agree at all* to 6 = *agree completely*). Nine statements measured Admiration (e.g., "I deserve to be seen as a great personality", $\alpha = 0.81$), and the other nine statements measured Rivalry (e.g., "Most people are somehow losers", $\alpha = 0.81$). The variables Admiration and Rivalry were composed of the average score of their respective subscales.

2.2. Results

2.2.1. Correlations

Bivariate (zero-order) correlations were calculated to assess whether narcissistic personality traits relate to perceived susceptibility of becoming infected. Perceived susceptibility as the average of the three items, was not significantly correlated to grandiose narcissism measured with the NPI-16 ($r = -0.069$, $p = 0.281$), Admiration ($r = 0.027$, $p = 0.678$), nor with Rivalry ($r = 0.021$, $p = 0.749$). However, there was a (non-preregistered) significant negative correlation between the item of estimated risk of becoming infected and the NPI-16, $r = -0.144$, $p = 0.024$. For a complete overview of the means, standard deviations and correlations see Table 1.

2.2.2. Regression

A linear regression model including the NPI-16, Admiration, and Rivalry as predictors of estimated risk of becoming infected was run in order to control for the effects of age and gender,[2] since these demographic variables have been shown to correlate robustly with grandiose narcissism (e.g., Zajenkowski, Jonason, Leniarska, & Kozakiewicz, 2020; Grijalva et al., 2015). In support of the hypothesis, grandiose narcissism measured with the NPI-16 significantly predicted lower perceived risk of infection with COVID-19 ($\beta = -0.22$, 95% CI [−0.14, −0.02], $p = 0.011$), also after controlling for age and gender. Admiration and Rivalry were not significant predictors of estimated risk, $p = 0.191$ and $p = 0.443$, respectively.

2.3. Discussion

In sum, Study 1 shows that stronger narcissistic traits measured with the NPI-16 significantly predicted lower perceived risk of infection with the coronavirus, also when controlling for age and gender. However, despite high internal consistency between the three perceived susceptibility items, narcissistic traits were only related to the risk item and not to the items that involved a social comparison element (i.e., the likelihood compared to peers of the same age and neighbours). In the next study, we aimed to replicate this finding, and improve our measure of

[1] Because behaviours were measured for exploratory purposes only, their relations to narcissism and perceived susceptibility are reported in the supplementary materials.

[2] These analyses were not preregistered, however during the writing process it became apparent that age and gender are important factors in the context of both Narcissism and perceived susceptibility, so it was decided to control for these factors.

Table 1
Means, standard deviations, and Pearson's correlations Study 1 ($N = 244$).

Variable	*M*	*SD*	1	2	3	4	5	6	7	8
1. Perceived susceptibility	2.66	0.94								
2. Estimated risk	2.78	1.09	0.874**							
3. Likelihood compared to peers	2.64	1.05	0.900**	0.688**						
4. Likelihood compared to neighbours	2.55	1.06	0.872**	0.615**	0.695**					
5. NPI-16	3.84	3.06	−0.069	−0.144*	−0.055	0.018				
6. Admiration	3.16	0.80	0.027	−0.025	0.027	0.070	0.603**			
7. Rivalry	2.33	0.82	0.021	0.001	0.027	0.028	0.338**	0.293**		
8. Age	26.71	7.61	0.094	0.089	0.073	0.086	−0.112*	−0.207**	−0.186**	
9. Gender[a,b]			0.082	0.063	0.054	0.088	−0.204**	−0.110**	−0.339**	0.249**

[a] Gender: 1 = *male*, 2 = *female*, non-binary ($n = 5$) was set to missing in correlations with Gender.
[b] Spearman's correlations are reported for correlations with Gender.
* $p < 0.05$.
** $p < 0.01$.

perceived susceptibility by including the affective component, *worrying*, as suggested by Leppin and Aro (2009). Lastly, it was decided to focus on UK residents only, to assure that all participants were native English speakers and were subjected to comparable governmental restrictions and media coverage of the virus.

3. Study 2

3.1. Method

3.1.1. Procedure and participants

Study 2 was conducted on March 16, 2020, via Prolific Academic. The study was only accessible to UK residents with English as their first language. The procedure was the same as in Study 1; with the additional question whether participants were *worried* about infection with the coronavirus. Participants from Study 1 were prevented from taking part in Study 2. Four participants failed the attention check, leaving 261 participants (70.5% female, 28.4% male, and 0.8% other non-specified). The mean age was 33.54 ($SD = 12.31$). Thirty-three (12.6%) participants indicated that they work in healthcare[3] and two participants tested negative for the coronavirus. Participants were paid £1.25.

3.1.2. Measures

3.1.2.1. Perceived susceptibility. In addition to the three questions in Study 1, a fourth question was added to measure perceived susceptibility; "I worry about being infected with the coronavirus COVID-19". All questions were answered on a 5-point Likert scale (1 = *Very low/Not at all* to 5 = *Very high/Very much*), $\alpha = 0.80$.

3.1.2.2. Narcissism. All measures of narcissism had adequate internal consistency, NPI-16 $\alpha = 0.75$, Admiration subscale $\alpha = 0.86$, and Rivalry subscale $\alpha = 0.82$.

3.2. Results

3.2.1. Correlation

First, bivariate correlations were calculated (see Table 2 for an overview of means, standard deviations and all correlations). There was a significant *positive* correlation between Perceived susceptibility and narcissism as measured with the Admiration subscale, $r = 0.178$, $p = 0.004$. This indicates that individuals with a greater desire to be admired had a higher perceived susceptibility to infection with the coronavirus. The subscale Rivalry was only positively correlated to the estimated risk item, $r = 0.148$, $p = 0.017$ (non-preregistered), but not to perceived susceptibility as a whole, $r = 0.078$, $p = 0.210$. In contrast to the finding in Study 1, narcissism as measured with the NPI-16 was not significantly correlated to perceived susceptibility as a whole, nor with any of the individual items, p's > 0.276.

3.2.2. Regression

These significant correlations were again followed up with a linear regression model in order to control for age and gender (non-preregistered). The model consisted of the NPI-16, Admiration, and Rivalry as predictors of perceived susceptibility. Consistent with the zero-order correlations, higher scores on Admiration predicted higher perceived susceptibility of infection with COVID-19 (($\beta = 0.277$, $b = 0.29$, 95% CI [0.12, 0.44], $p = 0.001$), also after controlling for age and gender, $\beta = 0.321$, $b = 0.31$, 95% CI [0.14, 0.47], $p < 0.001$. However, in support of our hypothesis, higher scores on grandiose narcissism as measured by the NPI-16 significantly predicted *lower* perceived susceptibility ($\beta = -0.194$, $b = -0.06$, 95% CI [−0.11, −0.01], $p = 0.027$), also after controlling for age and gender, ($\beta = -0.192$, $b = -0.06$, 95% CI [−0.11, −0.01], $p = 0.029$). Rivalry was not a significant predictor of perceived susceptibility, $p = 0.558$. Finally, age remained a significant predictor of perceived susceptibility after including both narcissism measures, $\beta = 0.144$, $b = 0.01$, 95% CI [0.00, 0.18], $p = 0.025$. Older individuals perceived themselves more susceptible to contract the coronavirus COVID-19.

3.3. Discussion

Study 2 demonstrated that in the UK sample the NARQ Admiration subscale predicted higher perceived susceptibility. Grandiose narcissism, as measured with the NPI-16, predicted lower perceived susceptibility after controlling for the variance shared with the NARQ subscales. Given the inconsistent results of Study 1 and Study 2, we ran a third study to test the robustness of these findings. Moreover, risk perceptions might change during the course of a pandemic. At the time of the data collection for Study 3, the UK government had implemented stricter policies, such as closing of school and workplaces, to prevent further spreading of the coronavirus (Hale et al., 2020).

4. Study 3

4.1. Method

4.1.1. Procedure and participants

The third study was conducted on March 31, 2020 via Prolific Academic. Only UK residents with English as their first language were invited to participate, participants from the previous studies were prevented from participating again. The study was preregistered at https

[3] Some participants in Study 1 wrote in the open comment section that they especially worried about getting infected because they work in health-care. We therefore assessed whether they worked in health-care in the two subsequent studies.

Table 2
Means, standard deviations, and Pearson's correlations Study 2 ($N = 261$).

Variable	*M*	*SD*	1	2	3	4	5	6	7	8	9
1. Perceived Susceptibility	3.04	0.85									
2. Estimated risk	3.20	1.09	0.857**								
3. Likelihood compared to peers	3.02	1.01	0.858**	0.683**							
4. Likelihood compared to neighbours	2.93	1.00	0.862**	0.706**	0.836**						
5. Worried	3.01	1.17	0.611**	0.349**	0.262**	0.254**					
6. NPI-16	2.82	2.77	0.030	0.068	0.008	0.003	0.014				
7. Admiration	2.80	0.88	0.178**	0.193**	0.181**	0.144*	0.054	0.679**			
8. Rivalry	2.06	0.77	0.078	0.148*	0.015	−0.005	0.079	0.490**	0.454**		
9. Age	33.54	12.31	0.100	0.088	0.037	0.100	0.089	−0.198**	−0.262**	−0.213**	
10. Gender[a,b]			−0.014	−0.050	0.012	−0.033	0.720	−0.216**	−0.140*	0.231**	0.158*

[a] Gender: 1 = *male*, 2 = *female*, other non-specified ($n = 3$) were set to missing in correlations with Gender.
[b] Spearman's correlations are reported for correlations with Gender.
* $p < 0.05$.
** $p < 0.01$.

://aspredicted.org/blind.php?x=nf7wx9. Six participants failed the attention check, leaving 261 participants (69.0% female, 30.7% male, and 0.4% non-binary). The mean age was 34.00 ($SD = 12.30$). Thirty-six (13.8%) participants indicated to work in health care. The payment was £1.25.

4.1.2. Measures

4.1.2.1. Perceived susceptibility. Perceived susceptibility was measured with the same four items as in Study 2, α = 0.81.

4.1.2.2. Narcissism. All measures of narcissism had adequate internal consistency, NPI-16 α = 0.77, Admiration subscale α = 0.84, and Rivalry subscale α = 0.83.

4.2. Results

4.2.1. Correlation

As in the previous studies we first calculated bivariate (zero-order) correlations (means, standard deviations, and an overview of all correlations can be found in Table 3). There was no significant correlation between perceived susceptibility as a whole and any of the narcissism measures, p's > 0.078. However, in support of our hypothesis, the NPI-16 was negatively correlated with the perceived likelihood of infection compared to same-aged peers ($r = -0.145$, $p = 0.019$) and with worrying, $r = -0.122$, $p = 0.049$. This suggests that individuals with stronger grandiose narcissistic traits estimated their likelihood to get infected as lower compared to other people of the same age, and were less worried about infection. The Rivalry subscale was also negatively correlated with likelihood of infection compared to same age peers, $r = -0.124$, $p = 0.045$.

4.2.2. Regression

First, we followed up on the significant correlations related to the estimated likelihood compared to same-age peers with a linear regression model, to control for age and gender. In the regression model with both the NARQ subscales and the NPI-16 as predictors, only the NPI-16 remained a significant predictor of estimated likelihood of infection compared to same age peers ($\beta = -0.196$, $b = -0.06$, 95% CI [−0.12, −0.01], $p = 0.028$), also after controlling for age and gender, $\beta = -0.178$, $b = -0.06$, 95% CI [−0.12, −0.00], $p = 0.048$. In correspondence with the zero-order correlations, age was a significant predictor of estimated likelihood of infection compared to same-age peers, $\beta = 0.143$, $b = 0.01$, 95% CI [0.01, 0.02], $p = 0.027$.

Second, to test for the robustness of the finding in Study 2, we ran a linear regression with the NPI-16, Admiration, and Rivalry as predictors of perceived susceptibility, while controlling for age and gender. Although the trends were in the same direction as in Study 2 (i.e., higher score on NPI-16 predicting lower perceived susceptibility and a higher score on Admiration predicting higher perceived susceptibility), it did not reach significance, respectively $\beta = -0.143$, $b = -0.04$, 95% CI [−0.09, 0.01], $p = 0.147$ and $\beta = 0.087$, $b = 0.09$, 95% CI [−0.08, 0.25], $p = 0.292$. Only age was a significant predictor in this model, $\beta = 0.151$, $b = 0.01$, 95% CI [0.00, 0.02], $p = 0.021$.

4.3. Discussion

The third study showed a similar pattern to what was found in Study 2, however, the narcissism measures did not significantly predict perceived susceptibility as measured by the average of the four items. Grandiose narcissism measured with the NPI-16, on the other hand, was a significant predictor of lower estimated likelihood of infection compared to same-age peers. The inconsistent results between the three

Table 3
Means, standard deviations, and Pearson's correlations Study 3 ($N = 261$).

Variable	*M*	*SD*	1	2	3	4	5	6	7	8	9
1. Perceived susceptibility	3.12	0.80									
2. Estimated risk	3.15	1.02	0.820*								
3. Likelihood compared to peers	2.97	0.93	0.835**	0.594**							
4. Likelihood compared to neighbours	2.93	0.90	0.823**	0.572**	0.733**						
5. Worried	3.43	1.15	0.743**	0.469**	0.419**	0.411**					
6. NPI-16	2.68	2.84	−0.109	−0.034	−0.145*	−0.058	−0.122*				
7. Admiration	2.79	0.81	−0.026	0.021	−0.020	0.047	−0.109	0.649**			
8. Rivalry	2.14	0.77	−0.050	0.014	−0.124*	−0.031	−0.039	0.537**	0.380**		
9. Age	34.00	12.30	0.166**	0.098	0.164**	0.083	0.186**	−0.278**	−0.260**	−0.224**	
10. Gender[a,b]			0.070	−0.032	0.038	0.062	0.181**	−0.172**	−0.031	−0.191**	0.134*

[a] Gender: 1 = *male*, 2 = *female*, non-binary ($n = 1$) was set to missing in correlations with Gender.
[b] Spearman's correlations are reported for correlations with Gender.
* $p < 0.05$.
** $p < 0.01$.

studies might be due to both insufficient statistical power and to sample characteristics (e.g., time period from onset of the pandemic and nationality). In order to tease these effects apart and to maximize statistical power to test the relation between narcissistic personality traits and perceived susceptibility in a final step, we pooled the studies together. We computed the zero-order correlations and ran a multilevel regression analysis while controlling for the source of the data (e.g., Curran & Hussong, 2009; Goh, Hall, & Rosenthal, 2016; McShane & Böckenholt, 2017).

5. Internal meta-analysis

5.1. Method

5.1.1. Data analysis plan

The three datasets were merged together and un-nested zero-order correlations were calculated. The merged dataset is available on OSF at https://tinyurl.com/y4a4ctk9. To measure the extent to which the narcissism measures can predict perceived susceptibility, also after accounting for gender and age, a linear mixed model regression was performed in SPSS 27. The variables NPI-16, Admiration, Rivalry, and age were grand mean centred (i.e., each individual score represents their deviation from the average score across the three studies) and together with gender, were entered as fixed coefficients in the regression model. The study number (i.e., Study 1, Study 2, and Study 3) was included as a level-2 predictor and the intercept and coefficient were allowed to vary randomly. Variance component was used as the random effect covariance type. We report maximum likelihood estimations for the regression coefficients. To determine the impact of study characteristics (e.g., time of data collection and homogeneity of the sample in terms of nationality) on the relation between narcissistic traits and perceived susceptibility, an interclass coefficient (ICC) was calculated. As a reference, an ICC of 0.05 is considered low and indicates that the influence of the level 2 predictor (i.e., study number) is negligible (e.g., Hox, Maas, & Brinkhuis, 2010).

5.1.2. Participants

All 766 participants who passed the attention checks were included in the analysis (60.6% women, 38.3% men, and 1.2% non-binary). The average age was 31.52 ($SD = 11.50$).

5.1.3. Measures

5.1.3.1. Perceived susceptibility. For the pooled analysis the outcome variable, Perceived susceptibility, is composed of the three items as measured in Study 1, thus excluding the item about worrying in the regression, because this was not consistently assessed across all studies. Cronbach's $\alpha = 0.87$.

5.1.3.2. Narcissism. All measures of narcissism had adequate internal consistency, NPI-16 $\alpha = 0.76$, Admiration subscale $\alpha = 0.84$, and Rivalry subscale $\alpha = 0.83$.

5.2. Results

5.2.1. Correlation

In support of the hypothesis, grandiose narcissism, as measured with the NPI-16, was negatively correlated with perceived susceptibility, $r = -0.075$, $p = 0.038$. The NARQ subscales Admiration and Rivalry were not significantly correlated with perceived susceptibility, respectively, $p = 0.351$ and $p = 0.774$. Age was positively correlated with all perceived susceptibility items (p's < 0.001); older participants perceived themselves as more susceptible to infection with the coronavirus COVID-19. Moreover, gender was significantly correlated with all narcissism measures, with men scoring higher than women, p's < 0.001. Table 4 displays the un-nested means, standard deviations and correlations of all variables.

5.2.2. Regression

Table 5 displays the multilevel regression model. The ICC of study source was 0.02, indicating that only 2% of the total variance of perceived susceptibility was explained by the source of the data (i.e., stemming from Study 1, 2, or 3). This signals that the inconsistent results across the three studies were likely due to power. In support of the hypothesis, stronger grandiose narcissistic traits, as measured by the NPI-16, significantly predicted lower perceived susceptibility to infection with the coronavirus, $\beta = -0.139$, 95% CI [−0.22, −0.05], $p = 0.002$. However, grandiose narcissism specified as a strong need for admiration (NARQ) significantly predicted higher perceived susceptibility to infection with the coronavirus, $\beta = 0.167$, 95% CI [0.08, 0.25], $p < 0.001$. Lastly, age was a significant predictor of higher perceived susceptibility to infection, $\beta = 0.115$, 95% CI [0.05, 0.18], $p = 0.001$.

6. General discussion

The aim of the present work was to investigate whether low perceived susceptibility to infection with the coronavirus COVID-19 is related to narcissistic personality traits because the same cognitive biases known to influence perceived susceptibility are commonly found as self-enhancement strategies in narcissistic individuals. Across all studies, we found that higher scores of grandiose narcissism, as measured with the NPI-16, predicted lower perceived susceptibility or risk of infection with COVID-19. One unanticipated finding was that people with higher scores on Admiration (NARC, Back et al., 2013) perceived themselves as *more* susceptible to infection. Moreover, these studies demonstrate that narcissistic traits are related to perceived susceptibility to infection also after controlling for the effects of age and gender.

In general, people are more likely to display an optimism bias for problems that they believe they can control (Klein & Helweg-Larsen, 2002). The results of the current studies connect this finding to narcissism, as narcissistic individuals are characterized by overconfidence in their skills and knowledge, and therefore have a high sense of control over their surroundings and outcomes (Macenczak, Campbell, Henley, & Campbell, 2016; Mathieu & St-Jean, 2013). The idea that more personal control lessens a threat is not per se illogical (e.g., De Neys, 2012); knowing how to navigate in risky situations will lower the chances of a bad outcome. The problem for narcissistic individuals is that their perception of control is not objectively supported by their skills (i.e., they only *think* they are good; Farwell & Wohlwend-Lloyd, 1998). A systematic overview of the relation between health and narcissism suggested that narcissistic individuals consistently inflate their self-reported health and fitness levels, even though their engagement in behaviours that contribute to good health are equal, or even lower, compared to non-narcissistic individuals (Konrath & Bonadonna, 2014). To illustrate, narcissism predicted both strong self-reported oral health *and* a low frequency of tooth brushing (once per day or less) in medical students (Dumitrescu, Zetu, Zetu, & Păcurar, 2013). Prevention policy makers are advised to take this invulnerability fallacy into account when designing campaigns to target groups with high prevalence of narcissistic traits — men and young adults.

Surveying a worldwide sample, Dryhurst et al. (2020) found that men consistently reported a lower perceived risk of infection than women, despite the fact that their objective risk of dying of COVID-19 is almost two and a half times higher (Jin et al., 2020). The present work corresponds with this finding, and contributes by showing that the effect of gender on perceived susceptibility disappeared when accounting for grandiose narcissism. This suggests that the factors that cause men to report lower perceived susceptibility are covered by grandiose narcissism measures. A meta-analysis has shown robust evidence that men show stronger narcissistic traits than women (Grijalva et al., 2015),

Table 4
Un-nested means, standard deviations, and Pearson's correlations of the pooled studies ($N = 766$).[a, b, *, **]

Variable	*M*	*SD*	1	2	3	4	5	6	7	8	9
1. Perceived Susceptibility	2.91	0.89									
2. Estimated risk	3.05	1.08	0.862**								
3. Likelihood compared to peers	2.88	1.01	0.885***	0.667**							
4. Likelihood compared to neighbours	2.81	1.00	0.874**	0.645**	0.762**						
5. Worried	3.22	1.18	0.545**	0.396**	0.327**	0.322**					
6. NPI-16	3.10	2.92	−0.075*	−0.066	−0.088*	−0.041	−0.058				
7. Admiration	2.91	0.85	−0.034	0.033	−0.034	0.051	−0.024	0.649**			
8. Rivalry	2.17	0.79	−0.010	0.029	−0.047	−0.026	0.029	0.537**	0.380**		
9. Age	31.52	11.50	0.155**	0.134**	0.131**	0.134**	0.138**	−0.278**	−0.260**	−0.224**	
10. Gender[a] [b,a,b]			0.078*	0.036	0.082*	0.088*	0.120**	−0.232**	−0.149**	−0.282**	0.236**

[a] Gender: 1 = *male*, 2 = *female*, other non-specified ($n = 9$) was set to missing in correlations with Gender.
[b] Spearman's correlations are reported for correlations with Gender.
* $p < 0.05$.
** $p < 0.01$.

Table 5
Multilevel regressions analysis of Perceived Susceptibility to infection with COVID-19 across pooled studies ($N = 756$).

Fixed effects[a]	*β*	*SE*	*t* (*df*)	*p*	95% CI
Intercept	2.84	0.14	20.17 (19.84)	<0.001	[2.54, 3.13]
NPI-16	−0.14	0.04	−3.18 (750)	0.002	[−0.22, −0.5]
Admiration	0.17	0.04	3.96 (750)	<0.001	[0.08, 0.25]
Rivalry	0.04	0.04	1.12 (750)	0.261	[−0.3, 0.11]
Age	0.12	0.03	3.40 (750)	0.001	[0.05, 0.18]
Gender[b]	−0.05	0.07	0.69 (750)	0.493	[−0.09, 0.18]

Random effects	*b*	*SE*	*Wald Z*	*p*	95% CI
Study number[c]	0.02	0.02	1.04	0.299	[0.00, 0.13]

[a] Fixed effects variables are grand mean centred.
[b] Gender: 1 = *male*, 2 = *female*, other non-specified ($n = 9$) were set to missing.
[c] Study number: 0 = *Study 1*, 1 = *Study 2*, 2 = *Study 3*.

especially the facets exploitation and leadership are more prominent among men than women. Even though the grandiose narcissism measures in the current studies (NPI-16 and the NARQ) do not account for these facets, a gender difference was found across all samples. Age remained a significant predictor of perceived susceptibility when including the narcissism measures, signalling that there are other factors besides overconfidence and self-absorption (Ames et al., 2006) that contribute to lower perceived susceptibility of young adults.

The unexpected finding that high scores on the NARQ Admiration subscale coincide with *higher* perceived susceptibility corresponds with a recent study with a Polish sample (Nowak et al., 2020). Using a different narcissism measure (the Dark Triad Dirty Dozen scale), the authors found that the Dark Triad traits (that includes narcissism, as well as, psychopathy and Machiavellianism) were related to higher perceived susceptibility to infection with COVID-19 (Nowak et al., 2020). It is possible that becoming infected with COVID-19 has a certain dramatic appeal to individuals with strong needs for admiration; infection would result in a special status in society, and receiving a lot of attention (e.g., Albarracin, 2015). Rivalry traits (but not Admiration) have been shown to be a predictor of ignoring governmental restrictions in relation to the coronavirus (Zajenkowski, Jonason, Leniarska, & Kozakiewicz, 2020). The authors suggested that individuals with strong rivalry scores might view the situation as less risky; however, in the current studies we found no evidence that Rivalry was related to lower perceived susceptibility. Lockdown restrictions possibility threaten the individuals' autonomy, invoking antagonistic tendencies (captured by the NARQ Rivalry subscale), whereas the threat of a non-human virus might not elicit this tendency.

It should be noted that the findings in this article are inconclusive and further research needs to be done to test the relation between perceived susceptibility and grandiose narcissism traits. Next, we want to point to potential suppression effects in the regression analyses (e.g., Lynam, Hoyle, & Newman, 2006). While the NPI-16 and the NARQ Admiration subscale share considerable statistical and conceptual overlap, the current studies contribute to the literature that suggests that it is their distinction after controlling for their overlap that holds unique predictive properties for behaviour and attitudes (Hart, Richardson, Tortoriello, & Breeden, 2019; Sedikides, 2020).

In discussing the findings, we also want to acknowledge the limitations of the present research and point to future directions. First, there is no standardized way to measure perceived susceptibility to illnesses in general (Ranby, Aiken, Gerend, & Erchull, 2010), let alone specifically to infection with the coronavirus COVID-19 (e.g., Dryhurst et al., 2020). We took caution to compose our perceived susceptibility measure of an absolute risk estimation and direct comparisons to others close in social distance (i.e., peers of the same age and neighbours) in all studies. In uncertain situations people tend to incorporate information about other people's choices and (health) risks in order derive a better sense of their own perceived risk (Buunk & Gibbons, 2007), which in turn helps them decide whether preventive action is necessary (Klein & Weinstein, 1997). Usually information about others in close social distance is therefore more informative and influential than information about distant others (e.g., Guo, Song, Liu, Xu, & Shen, 2019). Future research should investigate whether the social proximity of "the other" makes a difference for narcissistic individuals in updating their perceived susceptibility or estimated risk. Moreover, perceived susceptibility also seems to impact general risk updates, as new information is less likely to be deemed relevant (e.g., Ahn et al., 2014; Jaccard et al., 2005), which might exacerbate the problem. Longitudinal studies could be conducted to investigate the interplay of perceived susceptibility and updated beliefs after exposure to disease related information in individuals with strong narcissistic traits.

We furthermore want to acknowledge that the participants in the current studies were primarily from Western countries, and that the samples were not representative of the entire population in these countries. Moreover, we did not set out to study observable behavioral consequences of narcissists' altered risk perception.[4] As such, it might be useful to replicate the findings of the present studies using representative samples, to conduct the studies in other (non-)Western countries, and to include objectively observable behavioral outcomes in the analysis (such as hand disinfection upon entering a building). Furthermore, the observed effect sizes are small. However, in the context of the pandemic also small effect sizes matter, since an individuals' perceived

[4] However, see the supplementary files for the zero-order correlations of all pooled studies for perceived susceptibility, the NPI-16, the NARQ subscales and preventive behaviours.

susceptibility does not only bear consequences for this specific individual, but also for the people around them (e.g., Funder & Ozer, 2019). Lastly, we would like to emphasize that perceived susceptibility is not only influenced by biases (e.g., Van Der Pligt, 1998), but also by other factors, such as, awareness of local prevalence rates, and knowledge about effective protection measures, which were not accounted for in the current studies.

The insight from the present work that perceived susceptibility seems to be related to narcissistic personality traits, might help policy makers in effectively targeting individuals who perceive themselves at low risk of infection to COVID-19. While campaigns that invoke empathy for other people have good potential to increase wearing face masks and keeping distance for the population at large (e.g., Pfattheicher, Nockur, Böhm, Sassenrath, & Petersen, 2020), they might be less effective for narcissistic individuals(e.g., Hepper, Hart, & Sedikides, 2014). Instead, policy makers could appeal to aspects that are important to narcissists (e.g., Hill, 2017). Narcissistic individuals have been shown to knowingly take risks because potential rewards or benefits have a stronger appeal to them compared to individuals with lower narcissistic traits (Buelow & Brunell, 2014; Foster, Shenesey, & Goff, 2009). Because individuals with grandiose narcissistic traits are known to prefer settings in which there is a higher chance of receiving praise and attention (Grapsas et al., 2020), it might be especially appealing to ignore rules and recommendations about limiting contact with other people. This insight could be translated into adequate policies in this current corona setting, and suggests that initiatives that downplay the potential appealing benefits, such as closing down bars at 10 PM, might be more effective in reaching this target group.

6.1. Conclusion

Recent studies on the optimism bias in relation to COVID-19 have shown that people estimate their own risk of infection systematically lower compared to the risk of a similar other (Dolinski, Dolinska, Zmaczynska-Witek, Banach, & Kulesza, 2020; Kuper-Smith, Doppelhofer, Oganian, Rosenblau, & Korn, 2020). The findings reported in this article suggest that this effect might be related to narcissistic personality traits. These initial findings that narcissism measures predicted perceived susceptibility to infection with the coronavirus COVID-19, also when controlling for age and gender, aids in understanding how different aspects of narcissistic traits manifest themselves in critical situations. Knowing that risk perceptions are related to narcissistic personality traits can help in shaping effective prevention policies.

CRediT authorship contribution statement

Tina A.G. Venema: Conceptualization, Data curation, Formal analysis, Methodology, Writing – original draft, Writing – review & editing. **Stefan Pfattheicher:** Resources, Writing – original draft, Writing – review & editing.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.paid.2021.110696.

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