Contents lists available at ScienceDirect

Social Science & Medicine

journal homepage: www.elsevier.com/locate/socscimed

Self-uniqueness beliefs and adherence to recommended precautions. A 5-wave longitudinal COVID-19 study

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A B S T R A C T

Rationale: Research on health-related self-uniqueness beliefs suggested that these beliefs might predict adherence to precautions against COVID-19.
Objective: We examined if comparative optimism (believing that one is less at less than others), self-superiority (believing that one already adheres better to precautions than others), and egocentric impact perception (believing that adverse events affect oneself more than others) predicted intended adherence to precautions.
Method: We measured self-reported intentions, optimism for self and others, perceived past adherence by self and others, and perceived impact of the measures and the disease on self and others in a 5-wave longitudinal study in December 2020–May 2021 (N $\approx$ 5000/wave). The sample was in key respects representative for the Belgian population. We used joint models to examine the relationship between self-uniqueness beliefs and intended adherence to the precautions.
Results: Believing that COVID-19 would affect one's own life more than average (egocentric impact perception) was associated with higher intentions to adhere to precautions, as was believing that the precautions affected one's life less than average (allocentric impact perception). Self-superiority concerning past adherence to precautions and comparative optimism concerning infection with COVID-19 were associated with higher intended adherence, regardless of whether their non-comparative counterparts (descriptive norm, i.e., perceived adherence to precautions by others, and personal optimism, respectively) were controlled for. Comparative optimism for severe disease and for good outcome were associated with lower intended adherence if personal optimism was not controlled for, but with higher intended adherence if it was controlled for.
Conclusion: Self-uniqueness beliefs predict intended adherence to precautions against COVID-19, but do so in different directions.

1. Introduction

The COVID-19 crisis has raised awareness among public health authorities that novel infectious diseases may necessitate prolonged adherence by citizens to precautionary measures ('precautions' for short). Despite efforts to convince citizens of the importance of the precautions against COVID-19, adherence was often lower than authorities had hoped for (e.g., Hills and Eraso, 2021; Nelson-Coffey et al., 2021). It is therefore important to understand why people are or are not willing to adhere to precautions.

We investigated the role of a set of beliefs characterizing how one differs from other people ('self-uniqueness beliefs'). More specifically, we examined how comparative optimism, self-superiority, and egocentric impact perception predicted intended adherence to precautions. *Comparative optimism* is the belief that desirable events are more likely, and undesirable events are less likely to happen to the self than to others (Weinstein, 1980). *Self-superiority* is the belief that one is and acts better than others (Alicke, 1985). *Egocentric impact perception* is the belief that external events, including laws and regulations, affect oneself more than others (Blanton et al., 2001). Its hypothetical opposite is *allocentric*

impact perception, the perception that others are more affected than the self.

It is difficult to determine to what extent any given individual's self-uniqueness beliefs are accurate. However, most members of a group cannot act better, risk less, or be more affected than average (unless in very skewed distributions). The general occurrence of these phenomena has therefore been labelled '*unrealistic* optimism', '*illusory superiority*', and *egocentric* (or *allocentric*) impact bias.

Unrealistic optimism occurs concerning many health issues. For example, most people believe that they are less likely than others to get a heart attack, an addiction, or lung cancer (Weinstein, 1987). Unrealistic optimism also occurs regarding COVID-19 (e.g., Asimakopoulou et al., 2020), but it is stronger for getting infected than for falling severely ill (e.g., Delporte et al., 2022 under review). Showing *illusory superiority* concerning health behaviors, most people believe that they eat healthier and exercise more than their average peer (Hoorens and Harris, 1998) and that they adhere better to precautions against COVID-19-infection than average (Rose and Edmonds, 2021). Finally, *egocentric impact bias* has been reported concerning the impact of precautions against COVID-19-infection on some life domains, but *allocentric impact bias* on other ones (Hoorens et al., 2022). People generally believe that social distancing rules affect their hobbies and contacts with individuals outside their household more than average (egocentric impact perception), but also that these rules affect their income and contacts with individuals in their household less than average (allocentric impact perception). We are not aware of earlier research on egocentric impact bias concerning the disease itself.

Intuitively, the belief that getting infected with or suffering from COVID-19 may have worse consequences for the self than for others should encourage people to adhere to precautions. The belief that one is less likely to get infected or to fall severely ill, and the belief that one already acts more carefully even though that is harder for the self than for others may discourage adherence. However, findings on how self-uniqueness beliefs relate to behavior are rare and inconclusive. In one study, more egocentric impact perception concerning precautions against COVID-19 was associated with seeking more information about the disease but lower trust in information sources. Greater self-superiority was correlated with both fewer information being sought and lower trust (Hoorens et al., 2022). In another study, greater self-superiority was associated with higher intended adherence to precautions (Rose and Edmonds, 2021). Some researchers found a negative association of comparative optimism with adherence intentions (McColl et al., 2022; Park et al., 2021). Other research revealed a positive association of comparative optimism with adherence to precautions (Nordfjaern et al., 2021). A similarly inconsistent pattern occurred pre-COVID-19 concerning behavioral correlates of comparative optimism for other diseases (cf. Davidson and Prkachin, 1997; Dillard et al., 2006; Ingledew and Brunning, 1999; Park et al., 2017). In one of these pre-COVID-19 studies, individuals who were more (vs. less) comparatively optimistic concerning heart attacks were happier, exercised more, and learned more from an essay about heart attacks. The authors concluded that there was little evidence for the sometimes assumed maladaptiveness of comparative optimism; in fact, they considered it "a fairly accurate belief that is associated with a variety of favorable outcomes" (Radcliffe and Klein, 2002, p. 844).

One explanation for the inconclusiveness of findings is that studies considered different statistical models, from zero-order correlations to hierarchical regressions that included other aspects of risk perception and controlled for demographic variables. Among the variables most likely to be confounded with self-uniqueness beliefs are their non-comparative counterparts. For comparative optimism and egocentric impact perception that would be *personal optimism* and *perceived impact on the self*, respectively. For self-superiority, the non-comparative counterpart of greatest interest is the *descriptive norm*, i.e., the adherence to precautions by others. In earlier research, higher personal optimism concerning COVID-19 predicted lower intended or reported

adherence to precautions (Cipolletta et al., 2022; Qin et al., 2021) and a higher descriptive norm predicted higher intentions to adhere to precautions against COVID-19 (e.g., Latkin et al., 2022).

2. The present research

To examine if self-uniqueness beliefs predict intentions to adhere to precautions over and above non-comparative aspects of risk perceptions, we conducted a five-wave longitudinal study using a representative sample of the adult Belgian population. Belgium had major COVID-19 waves in the Spring and Autumn of 2020 and 2021. The first wave led to lockdown measures that were nevertheless less stringent than in some other countries, such as France, where a much more restrictive stay-in-place order was being implemented. A successful vaccination campaign began early in 2021. It coincided with the circulation of mainly the Alpha variant and, from May 2021 onwards, mainly the Delta variant. However, and as Fig. 1 shows, the non-pharmaceutical measures that were being implemented became less stringent over time. For more detail, please see Appendix 1 in the Supplemental Materials.

We measured comparative optimism, self-superiority, and perceptions of the relative impact of the disease and the precautions. Another paper (Delporte et al., 2022 under review) has reported unrealistic optimism for infection and severe disease, but not for a good outcome of an infection. As an ancillary goal of the present study, we tested the occurrence of illusory superiority and egocentric impact bias. We expected to find illusory superiority, but the scarcity and inconclusiveness of earlier research on the egocentric impact bias made us examine its occurrence exploratorily.

To disentangle self-uniqueness beliefs from their non-comparative counterparts, we measured self-uniqueness beliefs by asking judgments for the self and the average peer separately. The exception was egocentric impact perception concerning COVID-19 itself, where we had two reasons to use directly comparative items. First, we anticipated ceiling effects in personal impact ratings for at least some events, such as being admitted to an intensive care unit. Second, the subjective nature of impact ratings would have made a non-comparative scale vulnerable to the phenomenon that identical labels may convey different meanings depending on whom is being judged ('shifting standards'; cf. Biernat et al., 1997). Thus, personal impact ratings would have been uninterpretable.

3. Method

3.1. Transparency and openness

This study was part of longitudinal research on beliefs concerning COVID-19, vaccination, and precautions. We report findings on the relationship between self-uniqueness beliefs and intentions to adhere to precautions. Besides the variables used here, the questionnaire included measures of various other psychological variables. The full questionnaire is in the Supplemental Materials (Appendix 2). Findings on the relationship between comparative optimism, moralization, and vaccination have been reported elsewhere (Delporte et al., 2022 under review). The data and syntaxes for the present paper are available on OSF | Covid.Precautions paper. The full results are in the Supplemental Materials. We report all data exclusions.

3.2. Participants

Participants were Belgian members (18+) of the online panel of an international market research and polling agency (iVox). We aimed at a sample (N = 5000) that was representative for Belgium on gender, age group, education (No higher education, Higher education), and region (Brussels Capital Region, Flanders, Wallonia). In each wave, we included participants who had given informed consent for the wave and who had given likelihood estimates for at least one infection-related and one

Fig. 1. Non-pharmaceutical measures against COVID-19 in Belgium at the time of the study.

outcome-related event, and ratings of their general adherence to the precautions, of the impact of precautions, and of the impact of at least one COVID-19-related event. From Wave 2 on, panel members were invited to participate a month after they had given informed consent for an earlier wave. To compensate for attrition, new participants were invited until at least 5000 had given informed consent.

Table 1 shows key demographic characteristics. Our sample was highly educated as compared to the general population, and some age groups were overrepresented (45-54-years-olds) or underrepresented (65+) by more than 1–2%. However, the sample was sufficiently representative for our purpose. We provide information about participants' experience with COVID-19 and an overview of missing values in the Supplemental Materials (Appendix 3 & Appendix 4, respectively).

4. Material

Participants completed the questionnaire on the online platform Qualtrics in their preferred language (Dutch, French). The questionnaire was developed in Dutch and professionally translated into French. To minimize the burden on participants we used demographic information that they had supplied while registering for the panel.

Table 1
Key demographic characteristics of the samples per wave.

Wave	1		2		3		4		5	
Start (Day/Month/Year)	13.12.2020		12.01.2021		13.02.2021		17.03.2021		17.04.2021	
End (Day/Month/Year)	29.12.2020		02.02.2021		03.03.2021		12.04.2021		16.05.2021	
N Informed consent	5669		5286		5071		5083		5373	
N Actual participants[a]	5417		5116		4946		4968		5234	
Already in wave 1	5417		3175		3430		3200		2646	
Already in wave 2	–		1941		1386		1069		823	
Already in wave 3	–		–		130		70		58	
Already in wave 4	–		–		–		629		138	
Already in wave 5	–		–		–		–		1569	
	N	%	N	%	N	%	N	%	N	%
Gender										
Men	2643	48.8	2402	47.0	2392	48.4	2377	47.8	2470	47.2
Women	2767	51.1	2708	52.9	2540	51.4	2540	51.1	2742	52.4
Neither/Other/Missing	7	0.1	6	0.1	14	0.3	51	1.0	22	0.4
Age Group										
18–24 years	469	8.7	367	7.2	270	5.5	358	7.2	285	5.4
25–34 years	1025	18.9	863	16.9	719	14.5	774	15.6	750	14.3
35–44 years	815	15.0	777	15.2	715	14.5	768	15.5	822	15.7
45–54 years	1251	23.1	1160	22.7	1158	23.4	1140	22.9	1247	23.8
55–64 years	829	15.3	847	16.6	869	17.6	832	16.7	885	16.9
65+ years	1028	19.0	1102	21.5	1215	24.6	1096	22.1	1245	23.8
Education										
No higher education	2756	50.9	2650	51.8	2609	52.7	2589	52.1	2471	47.2
Higher education	2661	49.1	2466	48.2	2337	47.3	2379	47.9	2763	52.8
Household size										
1	1003	18.5	961	18.8	930	18.8	942	19.0	994	19.0
2	2124	39.2	2108	41.2	2124	42.9	2068	41.6	2249	43.0
3	1042	19.2	927	18.1	838	16.9	866	17.4	890	17.0
4	841	15.5	784	15.3	732	14.8	752	15.1	772	14.7
5+	407	7.5	336	6.6	322	6.5	340	6.8	329	6.3
Urbanization										
Large city	1258	23.2	1157	22.6	1079	21.8	1168	23.5	1148	21.9
Small city	1216	22.4	1153	22.5	1088	22.0	1101	22.2	1144	21.9
Large municipality	1350	24.9	1270	24.8	1295	26.2	1270	25.6	1406	26.9
Small municipality	1593	29.4	1536	30.0	1484	30.0	1429	28.8	1536	29.3
Region										
Brussels Capital Region	533	9.8	476	9.3	464	9.4	574	11.6	475	9.1
Flanders	3233	59.6	3058	59.8	3027	61.2	2903	58.4	3308	63.2
Wallonia	1651	30.6	1582	30.9	1455	29.4	1491	30.0	1451	27.7

[a] These are individuals who after having given informed consent answered key questions (see 'Participants').

Comparative and Personal Optimism. Participants estimated the likelihood that 6 COVID-19-related events would in the next 3 months happen to them and to the average person of their age and gender, by moving a slider from 0 (this will certainly not happen) to 100 (this will certainly happen). Two infection-related events (getting infected or re-infected, infecting others) appeared in a random order, followed by four events that might happen after a (re-)infection, also in a random order. Two involved severe disease (end up in hospital, end up in an intensive care unit) and two involved a good outcome (having few symptoms, fully recovering).

We created optimism scores such that higher scores always denoted greater optimism. For good outcomes, self-estimates served as personal optimism scores; comparative optimism scores were self-estimates minus other-estimates. For infection and severe disease, personal optimism scores were 100 minus self-estimates; comparative optimism scores were other-estimates minus self-estimates. By averaging across events, we obtained three personal and three comparative optimism scores per participant and per wave: for infection, severe disease, and good outcome.

Self-Superiority and Descriptive Norm. Participants indicated, for six precautions that were recommended or imposed at the time of the study, how often they and the average person of their age and gender had adhered to them in the last month: "Wash or disinfect one's hands extra often", ''Wear a face mask where one is obliged to", "Stay at home as much as possible", "Avoid crowded places", "Stay indoors after curfew", and "Limit the number of close contacts". Within targets (self vs. other), the items appeared in random order. Participants moved a slider between 0 (never) to 100 (always). We calculated a descriptive norm score by averaging responses for the average other, as the internal consistency of the scale was very high (Wave 1 Cronbach's alpha = .90). We calculated a self-superiority score by subtracting responses for the average other from those for self and averaging the differences (Wave 1 Cronbach's alpha = .85). We also measured global self-superiority directly by asking "As compared to the average person of your age and gender, how well have you adhered to the measures against the corona virus?". Participants answered on a 5-point scale from 1 (Much worse) to 5 (Much better).

Egocentric and Personal Impact Perception Concerning Precautions. Participants indicated how much the precautions had adversely affected themselves and the average person of their age and gender in the last month on three domains: work or study, leisure activities, and contacts outside the household. A 4-point scale from 1 (Not at all or to a very limited extent) to 4 (To a large extent) was used. We calculated a personal impact score by averaging self-ratings (Wave 1 Cronbach's alpha = .64) and an egocentric impact score by subtracting other-ratings from self-ratings and averaging these (Wave 1 Cronbach's alpha = .42). We measured global egocentric impact perception directly by asking: "As compared to the average person of your age and gender, how much have the measures negatively affected your life?", to be answered on a 5-point scale from 1 (Much less) to 5 (Much more).

Egocentric Impact Perception Concerning COVID-19. Participants judged how severe the consequences would be for them as compared to the average person of their age and gender should they get (re-)infected, end up in hospital, end up in an intensive care unit, and not fully recover after an infection, by moving a slider between −2 (much less severe) to +2 (much more severe). The instructions specified that they should make these judgments considering their way of life, including elements such as their job or study program, leisure activities, caring responsibilities, and personal relationships. We averaged across life domains to derive a mean egocentric impact perception score (Wave 1 Cronbach's alpha = .91).

Behavioral Intentions for Adherence to Precautions. Participants indicated how often they would in the next month show the same six behaviors as in the self-superiority measure, by moving a slider from 0 (never) to 100 (always). The items were again randomly ordered, and we calculated a mean intention score (Wave 1 Cronbach's alpha = .89).

4.1. Procedure

Panel members were invited through a link in their iVox account. We informed them upfront about the five-wave design but mentioned that participation in any given wave did not imply any obligation to participate in later ones. We also informed new participants that their responses were useful regardless of their non-participation in an earlier wave. Individuals who gave informed consent filled out the survey at a time and place of their convenience. The informed consent procedure and the debriefing informed participants about support lines and the necessity to call a physician should they experience symptoms. The research was ethically and legally approved by the Social and Societal Ethical Committee (SMEC) and the Privacy/Data Protection Officer of KU Leuven (application G-2020-2626/2626R4).

4.2. Statistical analysis

We used IBM SPSS Version 28.0.0 to examine the occurrence of self-superiority and egocentric impact perception and to explore the descriptive statistics for intended adherence in the various waves. All other analyses were done in JAGS, using the runjags v.2.2.1 package (Denwood, 2016), written in R v.4.1.1 (R Core Team, 2021).

We used joint modelling methods to understand the relationship between self-uniqueness beliefs and intended adherence to the precautions (see Appendix 6: joint model). Because we measured self-uniqueness beliefs and their non-comparative counterparts longitudinally, we used linear mixed models to summarize these measures into latent subject-specific intercepts. Although linear mixed models are intended for continuous data on the real line, they offer useful descriptions for other types of data as well, including these in our study.

The longitudinal outcomes were first modelled individually. As a robustness check, we also refitted these individual models using maximum likelihood. For more details, please see Appendix 5 in the Supplemental Materials. Afterwards, we combined these models into a joint model. We were forced to use joint models because the covariates were of a time-varying longitudinal nature. This necessitated us to treat them as endogenous variables; treating them as exogenous instead could have entailed biased results (Rizopoulos, 2012). In these joint models, the latent subject-specific intercepts of the self-uniqueness beliefs and their non-comparative counterparts served as predictors in the longitudinal linear mixed model of intended adherence. Importantly, the models for longitudinal predictor measurements were jointly fitted with the model for the longitudinal outcome. One important advantage of linear mixed models is that they are robust against departures from normality (Verbeke and Lesaffre, 1997).

We built two joint models of intended adherence per self-uniqueness belief: comparative optimism (separately for infection, severe disease, and good outcome), self-superiority, and egocentric impact perception (separately concerning the disease and concerning the precautions). For each self-uniqueness belief, the first model included only the random intercept of the self-uniqueness belief as a predictor. The predictors in the second model were the random intercepts of the self-uniqueness belief, its non-comparative counterpart, and their interaction. The models for optimism (separately for infection, severe disease, and good outcome) thus included comparative optimism, personal optimism, and their interaction. The model for past behavior included self-superiority, descriptive norm, and their interaction. The model for the perceived impact of the measures included egocentric impact perception, personal impact perception, and their interaction. We did not build a second model for the perceived impact of the disease, as we did not have non-comparative ratings of it.

All models also included the demographic covariates gender (men vs. women), age group (6 groups), educational level (no higher education, higher education), household size (1, 2, 3, 4, 5+), urbanization (large city, small city, large town, small town), and region (Brussels Capital Region, Flanders, Wallonia). We included these variables because earlier

research has suggested that they are associated with different levels of adherence to precautions and/or vaccination recommendations (e.g., Delporte et al., 2022 under review; Qeadan et al., 2020). In the fixed-effects structure, wave of data collection was a categorical predictor. As the distributions of behavioral intentions for adherence to the precautions, personal optimism (for infection, severe disease, good outcome) and descriptive norm for past behavior were skewed, we applied a logit-transformation.

Model parameters were estimated using Bayesian Markov Chain Monte Carlo (MCMC) estimation. As is common practice, we used non-informative priors for all parameters (Gelman and Hill, 2006). To assess the stability of our inferences and to examine the impact of the priors, we conducted sensitivity analyses by changing the parameters of the non-informative priors and refitted the models. Because we used a Bayesian framework and because of the exploratory nature of our study, we did not apply a correction for multiple testing. For more details, please see Appendix 7 in the Supplemental Materials.

We ran four parallel chains with random generated starting values for 15 000 iterations each. The first 10 000 iterations were discarded as burn-in period. To summarize the remaining 20 000 posterior samples (5000 iterations for each chain), we report the posterior means, standard deviations and 95% equal-tailed credible intervals. Convergence was assessed by examining the trace plots and Potential Scale Reduction Factors (PRSF; Gelman and Rubin, 1992). The PRSF values were below 1.01 for all parameters in all models, indicating that convergence can be assumed. Because parameters were estimated and inferences were drawn in a Bayesian framework, their validity is preserved if missing data are missing at random (MAR; Molenberghs and Kenward, 2007; Sidi and Harel, 2018), i.e., if missingness may depend on covariates and observed outcomes but, given these, not further on unobserved outcomes. This is known as 'ignorability' in the missing data literature.

5. Results

Descriptive statistics and test information for illusory superiority and egocentric impact perception appear in Table 2. Descriptive statistics and test information for unrealistic optimism from Delporte et al., (2022 under review) appear in the Supplemental Materials, Appendix 10. Participants reported that they had adhered better to the precautions than average (illusory superiority) and that these measures had affected them less (allocentric impact perception). However, they also reported that the precautions had generally affected their life more than average (egocentric impact perception), and that getting infected and experiencing relatively severe disease would also affect their life more (egocentric impact perception). Global self-superiority and egocentric impact ratings were correlated with self-other difference scores, but not very strongly. Because earlier researchers found that self-uniqueness scores derived from differences between self-judgments and other-judgments reflect self-uniqueness beliefs better than scores based on relative self-ratings (Aucote and Gold, 2005), we tested models using the average scores only.

Table 3 shows parameters and credible intervals for the models with behavioral intentions for adherence to the precautions as the outcome and the latent subject-specific random intercept of each type of belief as a predictor, controlling for demographic variables. Fig. 2 graphically represents the effects for Model 2 per self-uniqueness belief, with values at −1, 0, and +1 standard deviation of each predictor. This figure can be interpreted as showing the effect on intended adherence of a difference in the predictor of a standardized number of units. Appendix 9 in the Supplemental Materials includes heatmaps running from −2 to +2 standard deviations. The graphs and heatmaps represent findings for the category of reference, that is, the largest category in our sample on each demographic characteristic in Wave 1 (women, 45–54 years, no higher education, household of 2, Flemish, small municipality).

As shown in Fig. 2, higher comparative optimism for infection was associated with higher intended adherence, particularly among

Table 2

Self-superiority scores, egocentric impact scores, and intended adherence per wave.

	Wave 1	Wave 2	Wave 3	Wave 4	Wave 5
Self-superiority					
Average self-other difference across 6 precautions (0–100)					
Mean[a]	15.43	14.05	13.36	12.18	14.68
SD	16.95	16.61	16.01	15.90	16.52
t	66.99	60.42	58.66	53.95	63.49
df	5411	5107	4940	4960	5103
d	.91	.85	.83	.77	.89
Global rating (Relative rating, 2 to +2)					
Mean	0.79	0.66	0.54	0.46	0.51
SD	0.92	0.90	0.89	0.87	0.88
t	63.24	52.81	42.43	37.49	41.19
df	5416	5115	4945	4965	5106
d	.86	.74	.60	.53	.58
Correlation	.39	.36	.35	.37	.37
Egocentric/allocentric impact measures					
Average self-other difference across 3 life domains measures (−3 to +3)					
Mean	−0.09	−0.21	−0.23	−0.24	−0.24
SD	0.66	0.63	0.64	0.64	0.66
t	9.93	23.40	25.67	26.31	25.48
df	5339	5076	4912	4933	5070
d	−.14	−.33	−.37	−.38	−.36
Global rating (−2 to +2)					
Mean	0.09	0.10	0.04	0.05	0.02#
SD	0.92	0.88	0.84	0.84	0.82
t	7.25	7.78	3.11	4.53	1.50
df	5416	5115	4945	4967	5106
d	.10	.11	.04	.06	.02
Correlation	.28	.33	.35	.36	.36
Impact disease: Average rating across 4 COVID-19-related events (Relative rating, −2 to +2)					
Mean	0.42	0.40	0.34	0.35	0.29
SD	0.84	0.86	0.85	0.84	0.86
t	36.27	33.38	27.83	29.09	24.31
df	5416	5115	4945	4967	5106
d	.49	.47	.40	.41	.34
Intended adherence, averaged across 6 precautions (0–100)					
Mean	89.40	89.58	88.09	86.92	86.23
SD	14.86	14.50	15.51	16.78	15.58

Positive scores = self-superiority/egocentric impact perception.

[a] Except when indicated otherwise, all means differ from 0 at *p* < .001. #*p* = .067.

participants who scored high on personal optimism. In Model 2, the main effect of comparative optimism and the interaction with personal optimism were significant. When comparative optimism for severe disease or comparative optimism for good outcome was the sole predictor, it was associated with lower intended adherence. However, that association disappeared if personal optimism was also a predictor. In that case, higher comparative optimism predicted higher, rather than lower intended adherence, but only among participants with high personal optimism. For severe disease, the main effect of comparative optimism and the interaction with personal optimism were significant in Model 2. For good outcome, only the interaction of comparative optimism and personal optimism was significant.

Contrary to expectations, higher self-superiority was associated with higher intended adherence. As shown by the results of Model 2, this was particularly true among participants who perceived a high descriptive norm. Consistent with expectations, egocentric impact perception concerning COVID-19 was associated with higher intended adherence to the precautions (see Fig. 3).

Also as expected, higher egocentric impact perception concerning the measures was associated with lower intended adherence. However, the main effect of egocentric impact perception was in Model 2 qualified by an interaction with perceived impact on the self (see Fig. 4). Among participants who did not perceive a high impact of the precautions on the self, more egocentric (less allocentric) impact perception was associated with lower intended adherence. Among participants who did perceive a high impact of the precautions on the self, more egocentric

Table 3
Parameter estimates and credible intervals for the psychological random intercepts as predictors in the models.

	Estimate	SE	95% CI
Optimism infection			
Model 1 (Comparative optimism)	0.04	0.003	[0.035, 0.044]
Model 2			
Comparative optimism	0.06	0.003	[0.054, 0.067]
Personal optimism	−0.41	0.030	[−0.464, −0.352]
Interaction	0.02	0.002	[0.012, 0.018]
Optimism severe disease			
Model 1 (Comparative optimism)	−0.01	0.002	[−0.015, −0.006]
Model 2			
Comparative optimism	0.03	0.004	[0.019, 0.033]
Personal optimism	−0.34	0.023	[−0.383, −0.293]
Interaction	0.01	0.001	[0.004, 0.007]
Optimism good outcome			
Model 1 (Comparative optimism)	−0.03	0.004	[−0.033, −0.018]
Model 2			
Comparative optimism	0.01	0.009	[−0.009, 0.028]
Personal optimism	−0.26	0.074	[−0.409, −0.131]
Interaction	0.01	0.002	[0.001, 0.090]
Past behavior			
Model 1 (Self-superiority)	0.06	0.002	[0.059, 0.065]
Model 2			
Self-superiority	0.15	0.002	[0.141, 0.148]
Descriptive norm	1.83	0.021	[1.798, 1.880]
Interaction	0.01	0.001	[0.010, 0.014]
Impact of measures			
Model 1 (Egocentric impact perception)	−0.23	0.055	[−0.340, −0.128]
Model 2			
Egocentric impact perception	−0.59	0.179	[−0.929, −0.244]
Perceived impact on self	0.56	0.126	[0.327, 0.797]
Interaction	1.00	0.075	[0.844, 1.136]
Impact of disease			
Model 1 (Egocentric impact perception)	0.71	0.039	[0.641, 0.788]

(less allocentric) impact perception was associated with higher intended adherence.

The non-comparative counterparts of self-uniqueness beliefs were also associated with intended adherence. As expected, higher personal optimism for any aspect of COVID-19 was associated with lower intended adherence, particularly among participants with low comparative optimism (Fig. 2). Higher descriptive norm was associated with higher intended adherence (Fig. 3). Unexpectedly, higher perceived impact on the self was also associated with higher intended adherence. However, that effect was qualified by the interaction with egocentric impact perception. Among participants scoring relatively low on egocentric impact perception, higher perceived impact on the self was associated with lower intended adherence; among participants relatively high on egocentric impact perception, higher perceived impact on the self was associated with higher intended adherence (Fig. 4).

6. Discussion

We examined how self-uniqueness beliefs were associated with intentions to adhere to precautions against COVID-19. Participants reported that they had adhered better than average to the precautions against the spread of the virus that caused COVID-19. Our sample was balanced on gender and age and was generally representative for the Belgian population, in contrast to earlier research that involved less balanced samples (e.g., Hoorens et al., 2022; Rose and Edmonds, 2021). We thus provided strong evidence for the generality of illusory superiority.
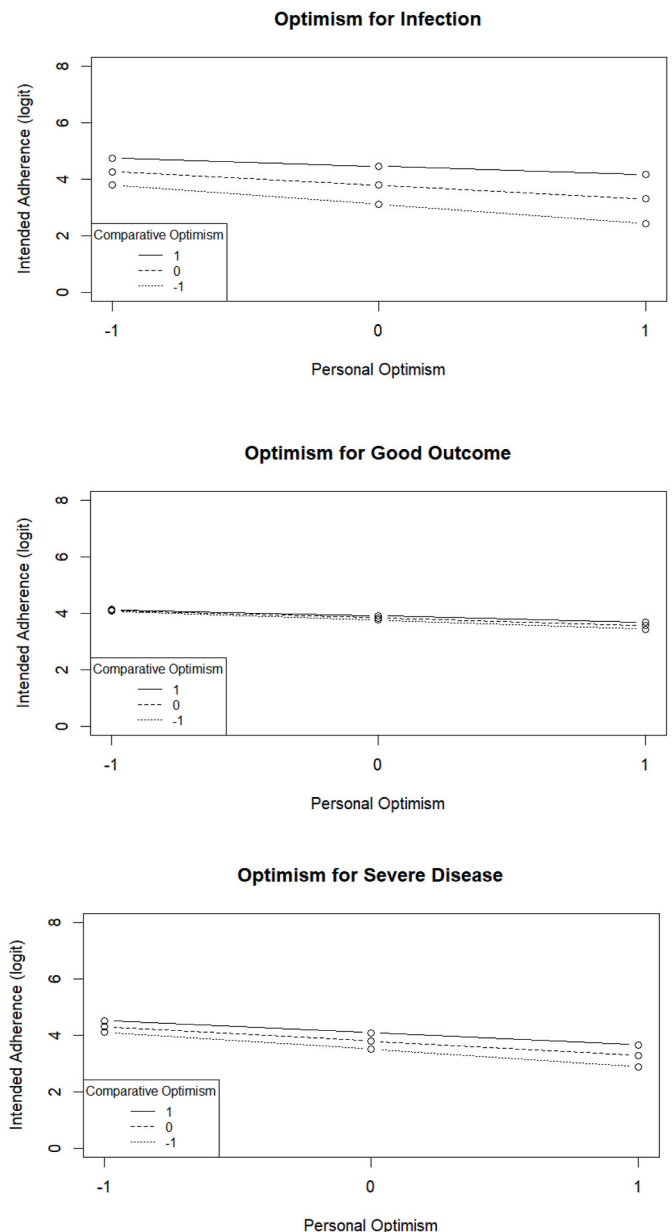

Fig. 2. Intended adherence to precautions as a function of optimism for infection (top panel), good outcome (middle panel), or severe disease (bottom panel) in the category of reference (Wave 1, Flemish women, small municipality, 45–54 years, no higher education, household of 2).

Participants reported that the precautions had generally affected them more than average, and that getting COVID-19 would affect their lives more than average. These findings are novel for COVID-19, but are consistent with the egocentric impact bias found in other contexts (Blanton et al., 2001; Davidai and Gilovich, 2016). Yet, we also found evidence for an allocentric impact bias. Participants reported that specific precautions had adversely affected their life less than average. We thus replicated a result from an earlier study that used a different measurement (i.e., directly comparative ratings), a different question wording, and non-representative sample (Hoorens et al., 2022). We thus showed that the allocentric impact perception is genuine and robust.

One factor that may determine whether egocentric or allocentric impact bias occurs may be the extent to which people believe that an event's impact is under one's personal control. If the impact of an event is largely beyond one's control, it does not negatively reflect on the self. People may then readily claim that the impact is greater for them than
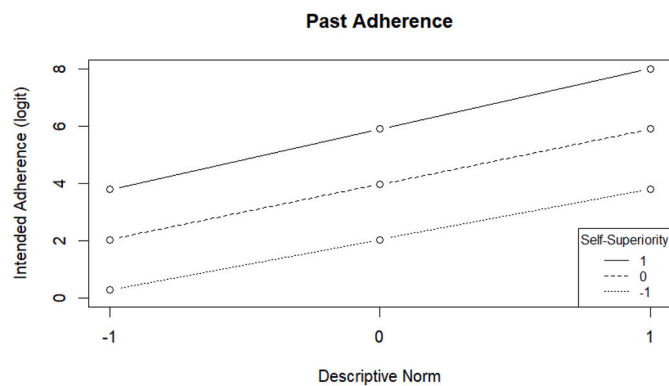
Past Adherence

Fig. 3. Intended adherence to precautions in the category of reference as a function of perceived past adherence.
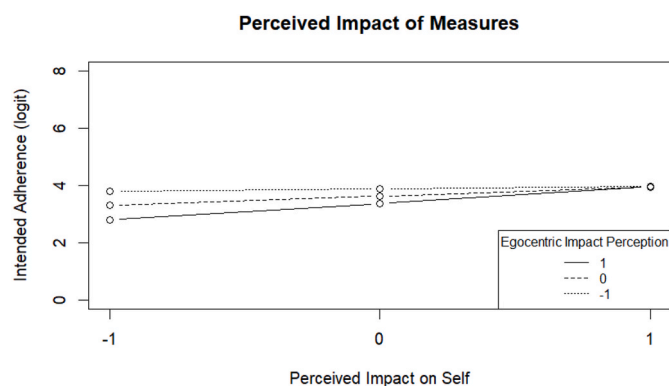
Perceived Impact of Measures

Fig. 4. Intended adherence to precautions in the category of reference as a function of impact perception concerning the precautions.

for others. If an event's impact is within one's control, it may reflect a lack of resourcefulness. People may then be motivated to claim less-than-average impact. In our study, participants may have considered both the potential impact of getting infected and developing symptoms and the potential impact of something as general as 'precautions' out of their hands. They may therefore have shown egocentric impact bias. In contrast, participants may have perceived well-circumscribed precautions as challenges that they should be able to cope with, and therefore have shown allocentric impact bias.

Differences in self-uniqueness beliefs were associated with differences in intended adherence to precautions. However, only the association between egocentric/allocentric impact perception and intended adherence was fully consistent with intuitive assumptions. People who strongly felt that COVID-19 would affect their lives more than average reported higher intentions to adhere to precautions, as did people who strongly felt that the precautions adversely affected them less than average. Comparative optimism concerning the transmission of COVID-19 infections was associated with higher, rather than lower intended adherence. Higher comparative optimism concerning what might happen after an infection – severe disease or a good outcome – was associated with lower intended adherence if personal optimism was not in the equation. If personal optimism was also included, higher comparative optimism was associated with higher, rather than lower intended adherence.

The findings for comparative optimism are interesting for several reasons. First, the results concerning infection are at odds with an often-invoked justification of comparative optimism research, that is, that comparative optimism discourages preventative and encourages risk behavior (Weinstein, 1980). Once we controlled for personal optimism, our results were consistent with the view that strong comparative

optimism may not always be a dangerous erroneous belief (e.g., Shepperd et al., 2013). Instead, it may reflect rather than (or besides) encouraging adherence to precautions (cf. Radcliffe and Klein, 2002). Consistent with that suggestion, making people contemplate their self-protective behavior enhanced their comparative optimism for infection but not for severity of the disease (Vieites et al., 2021). A similar situation may hold for self-superiority. The more people felt that they had better than average adhered to the precautions, the higher their intended adherence. Thus, higher self-superiority did not seem to impede behavioral intentions to adhere to the precautions.

Second, our findings concerning severe disease and good outcome reflect the inconsistent pattern that has been reported in the literature concerning the relationship between self-uniqueness beliefs (in most studies, comparative optimism) and health behaviors. Some researchers have reported negative associations (e.g., Dillard et al., 2006; McColl et al., 2022), others have reported positive associations (e.g., Vieites et al., 2021) or no association at all (e.g., Cho et al., 2013; Rudisill, 2013). We speculated that the inconsistency may be due to different statistical models being estimated. Here, including personal optimism reversed the association of comparative optimism with intended adherence. Interestingly, other researchers who partialed out variance associated with personal optimism also showed a weak association between comparative optimism and precautionary behavior at best (Rudisill, 2013; Wise et al., 2020).

The most plausible interpretation of our findings is that people more strongly intend to adhere to precautions against a potentially deadly disease if they are low on personal optimism, believe that others adhere to the precautions, and perceive the impact of the disease egocentrically but the impact of the precautions allocentrically. Then, the extent to which they believe to be less at risk than average (comparative optimism) and to adhere better to the precautions (self-superiority) is driven by, rather than driving their adherence.

The associations between non-comparative counterparts of self-uniqueness beliefs and intended adherence are interesting in their own right. Most were intuitive and consistent with earlier research. These included the negative association of intended adherence with personal optimism for infection, severe disease, and good outcome, and the positive association of intended adherence with descriptive norm. An exception was the positive association of intended adherence with the perceived impact of the precautions on the self. Here, too, an interpretation where some beliefs function as antecedents and others as consequences of intended adherence seems plausible. Lower personal optimism, higher descriptive norm, and greater perceived impact of the disease on the self may encourage higher intended adherence, which may in turn inspire greater perceived impact of these measures on the self.

6.1. Strengths

Our study was among the few longitudinal studies including multiple waves over a period of several months on correlates of self-uniqueness beliefs concerning COVID-19 or on intended precautions against the spread of the disease. Thus, it makes an important step forward in a research line with foundations in a multitude of cross-sectional studies (e.g., Asimakopoulou et al., 2020; Dryhurst et al., 2020) and in a limited set of longitudinal studies covering brief periods from one week to one month (e.g., Rubaltelli et al., 2020; Wise et al., 2020) or consisting of a combination of cross-sectional surveys on independent samples (Schneider et al., 2021).

Moreover, we chose a statistical approach that had several strengths, of which we here discuss the two main ones. First, joint models allow the inclusion of endogenous longitudinal predictors, i.e., predictors that are affected by (previous) measurements of other variables in the model, potentially also the outcome, in contrast to exogenous variables that presumably are not affected by these other variables. When exogeneity is incorrectly assumed, estimates can be biased. Thus, unlike some more

mainstream statistical models that often assume exogeneity, joint models allow for predictors to be affected by previous outcome values, as well as affecting future outcome values. In our research, the joint models allowed for self-superiority beliefs and their non-comparative counterparts to be predicted by intended adherence to precautions as well as for intended adherence being predicted by self-superiority beliefs. In our research, the joint models allowed for self-superiority beliefs and their non-comparative counterparts to be endogenous.

Second, joint models optimally capture the available information about the measured variables by including all sources of variability simultaneously. Thus, they do not simply use the central tendency that summarizes various longitudinal measures as a single predictor in the model of the to-be-predicted variable, but also take the systematic and nonsystematic variability between the measures of the latent predictor variable into account.

Our sample was exceptionally large and more representative for the general population in terms of critical demographic variables than studies using convenience samples or snowballing recruitment techniques might be. We thus avoided the inbalance that has characterized studies using student populations or using social media and snowballing methods to recruit participants. For example, in several earlier studies on COVID-19-related comparative optimism samples included a disproportionally high number of women (e.g., Asimakopoulou et al., 2020).

We used a measure of risk perception that was conceptually unequivocal (likelihood estimates) and a measure of behavioral intentions that allowed more fine-grained responses than a binary yes/no answer. Measures where participants merely indicate whether they have adhered to precautions (with researchers counting the number of affirmative answers as a measure of adherence) are well-suited for research where the goal is to obtain a general impression of adherence to precautions (e.g., Bruine de Bruin and Bennett, 2020; Schneider et al., 2021). However, they might obscure subtle differences in respondents' perception of their own and other people's adherence levels. Our measure avoided that problem.

6.2. Limitations

The associations between self-uniqueness beliefs and intended adherence were small for traditional psychological standards. However, small effects may be consequential, especially if they accumulate over time (Funder and Ozer, 2019; Götz et al., 2022). We therefore believe that our findings have practical and theoretical significance.

Average intended adherence was high, and rather close to the scale maximum. This might raise questions about a potential ceiling effect. However, the sample size was large, and variation was considerable. Combined with the robustness of the linear mixed model framework against deviations from normality (Verbeke and Lesaffre, 1997), this renders it unlikely that a ceiling effect has jeopardized our results.

Our non-experimental data did not allow to conclusively determine if self-uniqueness beliefs are causes or consequences of preventative behavior, a feature that our research shares with most research on comparative optimism (cf. Shepperd et al., 2013). Thus, our findings should not be construed as showing that comparative optimism, self-superiority, and egocentric impact perception concerning a disease are beneficial for taking precautions and that egocentric impact perception (low allocentric impact perception) concerning precautions is generally harmful. We merely observed that *differences* in self-uniqueness beliefs were associated with *differences* in intended adherence to precautions against COVID-19.

We tried to comprehensibly capture the range of precautions that were in place at the time of the study. However, self-uniqueness beliefs may be differently associated with health behavior other than the type that we studied. Earlier studies that showed negative associations between comparative optimism and health behavior often focused on information seeking, processing, and application (e.g., Cho et al., 2013;

Park et al., 2017) or participation in vaccination programs (e.g., Agarwal, 2014; Delporte et al., 2022 under review). It is possible, therefore, that some behaviors (e.g., behaviors that require discrete decisions at given points in time) are negatively associated with self-uniqueness whereas behaviors that require a sustained effort over a longer period are positively related to them.

Our measures also involved limitations. First, we used self-reported measures, of which the validity has been disputed (e.g., Hansen et al., 2022). However, some studies yielded no reason to assume that self-reports of relevance to COVID-19 were substantially distorted by social desirability (e.g., Jensen, 2020; Larsen et al., 2020). Second, the conceptual clarity achieved by our operationalization of perceived risk in terms of estimated likelihoods came with the downside that our measure tapped into cognitive aspects of risk perception only. Other research has shown that affective aspects such as worry and fear also predict behavioral intentions (e.g., Harper et al., 2021).

Third, we measured egocentric impact perception/bias concerning the disease comparatively only. As we already explained, this was inspired by anticipated ceiling and shifting standards effects. However, it implies that we could not distinguish between egocentric impact perception/bias and its non-comparative counterpart. That does not affect our conclusion that an egocentric impact bias exists concerning COVID-19, but caution is in order concerning the interpretation of the association between individual differences in egocentric impact perception predict and intentions to adhere to precautions against COVID-19. Fourth, our measure of egocentric impact perception concerning the precautions had a low internal consistency. We treated impact perception as a unitary construct because of the already high complexity of our dataset, but future research might usefully investigate differentiated perceptions of how precautions affect oneself more or less than others on various life domains.

Finally, the impact of deviations from the MAR assumptions underlying our analysis might be explored using multiple imputation under MNAR (missing not at random, i.e., missingness depends on unobserved outcomes even after correction for covariates and observed outcomes; Molenberghs et al., 2015). However, that would take us beyond the scope of the current manuscript.

7. Implications

We found no evidence that greater comparative optimism or greater self-superiority concerning past adherence to precautions was associated with lower intentions to adhere to these precautions in the future. Thus, when the aim is to enhance adherence to precautions against a contagious disease like COVID-19 (rather than, say, to encourage vaccination), there seems to be no strong need for public health communicators to pay particular attention to those subgroups or individuals who show strong comparative optimism or self-superiority. Instead, we found that the negative association between personal optimism and intended adherence was *mitigated*, rather than exacerbated, among individuals who showed greater comparative optimism.

The feeling that precautions affect oneself *more than others* was associated with lower intended adherence to these precautions, particularly among participants who generally feel that the precautions did not affect them very strongly. Thus, even though public health communicators may be tempted not to worry too much about those individuals who seem to take the precautions rather lightly, the accompanying belief that one is still more affected than average should function as a warning light.

The perception that one's life would be affected more than average (egocentric impact perception concerning the disease) should one get infected and get ill is associated with particularly strong intentions to adhere to precautions. That implies that the often-used rhetoric in public health messages (at least in Belgium, where the study was conducted) that people should adhere to the precautions 'to protect others' and 'to save lives' may be problematic, at least if the messages go hand in hand

with an explicit acknowledgement that the target audience itself may have little to fear from a spell of COVID-19.

These implications should not be taken as showing that at least two self-uniqueness beliefs – comparative optimism and self-superiority – are totally non-problematic. After all, we did find that relative self-judgments concerning COVID-19 are miscalibrated – we found *illusory* superiority, *unrealistic* optimism and impact *bias*. Although people who show relatively strong self-uniqueness beliefs are not always those who intent to adhere to precautions less than others, unrealistic optimism and illusory superiority may generally reduce efforts to adhere well to precautions, just like egocentric impact bias concerning the precautions may do and just like egocentric impact bias concerning the disease itself may enhance adherence. Thus, we propose that the general mis-calibration that we – and, in the case of unrealistic optimism and illusory superiority other researchers as well (e.g., Asimakopoulou et al., 2020; Rose and Edmonds, 2021). – have observed may help explain why adherence has in many countries been lower than public health authorities might have desired.

From a methodological point of view, arguably the most important finding of our research is that including the non-comparative counterparts of self-uniqueness beliefs affects the observed associations between them and intentions for precautions. In the case of comparative optimism concerning the outcome of infections, we found that it even reversed the association. For an unequivocal understanding of how self-uniqueness beliefs relate to health behavior, therefore, it may be good practice to test these associations once with the involved belief considered in isolation and once controlling for additional predictors. As our results show, one obvious candidate is the non-comparative counterpart of each self-uniqueness belief. In any case, one should clearly distinguish between comparative and non-comparative aspects of risk perception, as their interplay might obscure significant relationships that each of them holds with preventative behaviors, potentially even entailing null effects for risk perception (e.g., Clark et al., 2020).

8. Conclusion

People show illusory superiority concerning their past adherence to precautions against a contagious disease. They also show egocentric impact bias concerning the disease and generally described precautions against it on their life, but allocentric impact bias concerning specific precautions. As expected, greater intended adherence to precautions against the disease was observed in individuals who showed more egocentric impact perception concerning the disease and greater allocentric impact perception concerning specific precautions. However, it was also observed in individuals showing stronger comparative optimism for infection and stronger self-superiority. Comparative optimism for severe disease and a good outcome predicted lower intended adherence only if personal optimism was not being controlled for. If it was being controlled for, comparative optimism predicted greater intended adherence. Thus, self-uniqueness beliefs may not always be as harmful for health and safety behavior as they are sometimes assumed to be.

Credit author statement

Dries De Witte: Methodology, Software, Validation, Formal analysis, Data curation, Writing – original draft, Writing – review & editing, Visualization; **Margaux Delporte**: Methodology, Formal analysis, Writing – original draft, Writing – review & editing; **Geert Molenberghs**: Conceptualization, Methodology, Resources, Writing – review & editing, Funding acquisition; **Geert Verbeke**: Conceptualization, Methodology, Resources, Writing – review & editing, Funding acquisition; **Stefaan Demarest**: Conceptualization, Methodology, Writing – review & editing, Funding acquisition; **Vera Hoorens**: Conceptualization, Methodology, Investigation, Project administration, Writing – original draft, Writing – review & editing, Funding acquisition.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi. org/10.1016/j.socscimed.2022.115595.

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