# Recent personal and vicarious experience with COVID-19 affects personal, but not comparative optimism: a large longitudinal study

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# Recent Personal and Vicarious Experience With COVID-19 Affect Personal, but not Comparative Optimism. A Large Longitudinal Study.


## Abstract

We examined whether personal and vicarious experience with COVID-19 entails change in personal and comparative optimism (the belief that one is less at risk for hazards than others, also known as unrealistic optimism, optimistic bias, or illusion of unique invulnerability) in a large ($N \approx 5000$) 5-Wave longitudinal study conducted in Belgium in December 2020-May 2021. Participants reported their experience with COVID-19 as well as their expectations concerning the likelihood that they and the average peer would get infected and, after an infection, would suffer severe disease or rather register a good outcome. Neither personal nor vicarious experience entailed change in comparative optimism, but both entailed reduced personal optimism about the likelihood of an infection and enhanced personal optimism concerning a good outcome. Personal and vicarious experience entailed reduced perceived control over the likelihood of infection and the likelihood of severe disease, and vicarious experience also reduced perceived control over a good outcome. However, these changes were not mediated by effects on perceived control. We discuss methodological implications for research on determinants of risk perception as well as the implications of our findings for public health communication appealing to people's personal and vicarious experiences.


*Keywords*: Risk Perception; Comparative Optimism; Personal Optimism; Experience; COVID-19

**Recent Personal and Vicarious Experience With COVID-19 Affect Personal, but not Comparative Optimism. A Large Longitudinal Study.**

Most people believe that they are less at risk than others for many health and safety problems (Weinstein, 1980, 1983, 1987), including COVID-19 (e.g., Asimakopolou et al., 2020; Delporte, De Witte et al., 2023; Delporte, Luyts et al., 2023; Kulesza et al., 2021). We call this phenomenon comparative optimism, but it is also known as unrealistic optimism, optimistic bias, or illusion of unique invulnerability (Shepperd et al., 2013). We examined to what extent personal and vicarious experience with COVID-19 affects comparative optimism concerning the disease and if so, if that is due to an effect on personal optimism, optimism for others, or both.

Having been affected by a hazard is typically associated with reduced comparative optimism concerning that hazard (e.g., Helweg-Larsen & Shepperd, 2001; Shepperd et al., 2003). However, this may not be the case for COVID-19. At least two features of COVID-19, as it was known at the time of our study, set the disease apart from other hazards in the context of which the effects of being victimized on comparative optimism have been examined. First, many members of the general public may have believed that having had the disease lowered one's likelihood of getting re-infected in the short term, as is the case with certain other infectious diseases. Thus, having had COVID-19 might increase, rather than decrease comparative optimism concerning the *likelihood* of an infection with the coronavirus. Second, we assumed that most participants who had been ill with COVID-19 by the time of our study would have suffered from relatively mild symptoms. In any case, they would all have recovered enough to participate in the study. Earlier research has shown that being 'only mildly' affected by a natural disaster may give people a sense of security (Wachinger et al., 2013). Thus, having gone through a relatively mild case of COVID-19 might make people more, rather than less comparatively optimistic concerning the *outcome* of a future infection (i.e., the severe versus mild course of the disease). Studying the effect of experience on comparative optimism for a hazard with these features could offer important insights in the generality and robustness of earlier findings on the effects of experience on comparative optimism.

Before articulating our research question, we below review the literature concerning the relationship between experience with a hazard and comparative optimism in more detail. We first examine the evidence that being affected by a hazard entails reduced comparative optimism concerning that hazard. We then address some specific questions. One is whether the reduction of comparative optimism (if any) is associated with a reduction of personal optimism, an increase of optimism for others, or both. The second question is whether only personal (first-hand) experience reduces comparative optimism or whether vicarious experience also does so. The third question is whether experience with a hazard diminishes comparative optimism by undermining people's sense

of control over that hazard.

**Experience and Comparative Optimism**

Earlier research on the relationship between experience with a hazard and comparative optimism concerning that hazard is mostly correlational and retrospective. Participants report if they have lived through unpleasant events in the past and express their expectations concerning future occurrences of these events. Those who report experience with the events generally show lower comparative optimism regarding future occurrences of them (e.g., Shepperd et al., 2003; Weinstein, 1980).

Some studies contrast comparative optimism in participants that are known to be more or less affected by the hazard under study. For example, Weinstein et al. (2000) examined people's perceptions of the relative risk of a tornado hitting one's town, damaging one's home, and inflicting physical injury on the self in towns that had recently been hit by a tornado ('tornado towns') or towns with a similar history but no recent incident ('control towns'). Respondents in tornado towns showed less comparative optimism than respondents in control towns.

The lowered comparative optimism after experience with a hazard seems quite general. It occurs for health and safety problems (Dolinski et al., 1987; McKenna & Albery, 2001; Van Der Velde et al., 1994; Weinstein, 1987), entrepreneurial risks (Ucbasaran et al., 2010), online privacy risks (Cho et al., 2010), and natural disasters such as tornados (Weinstein et al., 2000), earthquakes (Helweg-Larsen, 1999; Helweg-Larsen & Shepperd, 2001; Shepperd et al., 2003), and hurricanes (Trumbo et al., 2014).

At least one study suggested that the impact of experience with a natural disaster might be short-lived. Respondents did not generally show comparative optimism for getting injured in a natural disaster immediately after an earthquake, but comparative optimism had returned to pre-earthquake levels three months later (Burger & Palmer, 1992). Another study showed a longer-lasting effect. Individuals who had survived an earthquake did not generally show comparative optimism for earthquakes five months later (whereas they did show comparative optimism for other events); individual differences in comparative optimism were correlated with the extent to which they reported injuries (of themselves or their loved ones) or financial damage (Helweg-Larsen, 1999).

**Whose Risk?**

Earlier research suggests that if experience with a hazard entails reduced comparative optimism, it is through reduced personal optimism rather than through enhanced optimism for others (Baker et al., 2009; Helweg-Larsen & Shepperd, 2001; Weinstein et al., 2000). For example, suffering privacy infringements entails enhanced perceived privacy risks for the self more than for society at large (Cho et al., 2010). However, if experience entails *enhanced* comparative optimism, that may reflect enhanced optimism for the self, reduced optimism for

others, or both. It is also possible that no association between experience and comparative optimism is observed if experience entails changes in risk perception for both the self and others (Roe-Berning & Straker, 1997). To fully understand change or the lack thereof in comparative optimism after experience with a hazard, it is therefore important to measure comparative optimism in a way that allows disentangling changes in personal optimism and changes in optimism for others.

Two measurement approaches dominate the field. The 'direct method', used in the seminal paper on comparative optimism (Weinstein, 1980), involves asking people to rate how likely it is that events will happen to them as compared to others. The 'indirect method', which Weinstein (1989) called interchangeable with the direct method, involves asking people to separately estimate the likelihood that events will happen to them and to others and calculating the difference between their estimates. While this approach typically yields somewhat weaker comparative optimism than the direct method, it allows researchers to distinguish between the role of personal optimism and the role of optimism for others in comparative optimism (for a more extensive discussion of both approaches, see Aucote & Gold, 2005; Covey & Davies, 2004: Rose, Suls, & Windschitl, 2011).

**Whose Experience?**

Most studies on the relationship between the confrontation with the hazard and comparative optimism concerning that hazard involved personal experience with the hazard at hand or pooled personal and vicarious experience (e.g., Cho et al., 2010; Kollmann et al., 2022). For example, in a study on the effects of experience with a terrorist attack on risk perception concerning such an attack, experience was operationalized as having lived through an attack, having been near the site of one, and/or knowing someone who had been injured or killed (Kollmann et al., 2022).

Studies that distinguish between personal and vicarious experience are scarce, and their findings are mixed. At least one study suggested that vicarious experience may *enhance* comparative optimism. The more friends with a history of breast cancer women in one study said they had, the more they felt that their risk was below their peers' risk (Katapodi et al., 2010). In other studies, vicarious experience was associated with *reduced* comparative optimism (Helweg-Larsen et al., 2011; Sylvestre et al., 2023). For example, parents were already less comparatively optimistic concerning their child's likelihood to develop various health problems if they knew about other children who had suffered from them (Sylvestre et al., 2023). In another study, knowing that others had suffered privacy infringements on social media was associated with *lower* comparative optimism if the victims were close others, but *higher* comparative optimism if they were distant others (Cho et al., 2023).

In sum, whereas personal experience is typically followed by a (sometimes short-lived) reduction, vicarious

experience was in earlier studies followed by either an increase or a decrease in comparative optimism. Thus, witnessing significant others experiencing a hazard apparently takes on a different psychological meaning than experiencing that hazard oneself. For an unequivocal understanding of changes in comparative optimism after experience with a hazard it is therefore necessary to distinguish between personal and vicarious experience.

**Perceived Control as a Mechanism**

People are particularly comparatively optimistic concerning hazards that they perceive as being under their personal control (Harris et al., 2008; Klein & Helweg-Larsen, 2002; Kos & Clarke, 2001; Weinstein, 1980). In the case of COVID-19, people show greater comparative optimism concerning the risk of getting infected than concerning the risk of an infection entailing serious disease. That greater comparative optimism goes hand in hand with greater perceived control over the risk of an infection than over the outcome of the infection (e.g., Asimakopoulou et al., 2020; Hoorens et al., 2022). There is also evidence that perceived control as a stable personality characteristic is associated with higher personal optimism (Fontaine et al., 1993) as well as comparative optimism (Darvill & Johnson, 1991; Hoorens & Buunk, 1993).

Of particular importance for our research, some studies showed that experience with an unpleasant event reduced people's perceptions of control over the event (Weinstein et al., 2000). Thus, one mechanism through which experiencing an unpleasant event may influence optimism is by affecting people's feelings of control.

**The present research**

During the global COVID-19 crisis, we conducted a longitudinal study on the effect of prior personal and vicarious experience on comparative optimism concerning both infection with the virus that causes COVID-19 and the outcome of the infection. We addressed four understudied issues.

First, we examined the association between experience and comparative optimism in the context of a hazard where the effect of experience was largely unknown. Earlier research concerning other hazards might not be readily generalizable to COVID-19 because of the features of COVID-19. A previous infection is (or was) believed to protect against (the outcome of) infections in the near future, and the outcome of an infection is greatly divergent across individuals in (at the time of our research) to a large extent unpredictable manner.

Second, we measured comparative optimism through the indirect method, that is, by separately eliciting and comparing risk estimates for the self and for the average peer. Doing so allowed us to examine whether a potential effect on comparative optimism can be attributed to an effect on personal optimism, on optimism for others, or both. It also allowed us, in case we did not find an association between experience and comparative optimism, to determine whether this was due to the absence of any effect on risk perception, or to similar effects

on personal optimism and optimism for others.

Third, we distinguished between personal and vicarious experience. We could thus contribute to the as yet very small literature on the relative effects of these two types of experience. In combination with our separate measures of personal optimism and optimism for others, we could also examine if the locus of potential effects was different for personal experience and vicarious experience. Fourth, we examined one potential mediator of the role of experience on comparative optimism, that is, perceived control.

Fourth, we examined these issues using a design that was stronger than many earlier studies on the effect of experience with a hazard and comparative optimism for it. A correlation between experience and comparative optimism might occur if experience affected comparative optimism, if participants justified their low or high comparative optimism by claiming experience or the absence of any experience, or if a third variable affected experience and comparative optimism. Our longitudinal approach allowed us to make progress towards disentangling these possibilities.

## Method

### Transparency and Openness

The research was part of a larger longitudinal study on beliefs and behaviors concerning COVID-19, . i.e., a study where respondents are followed over time. Appendix 1 contains the full questionnaire. We have published details about the procedures and the findings of other aspects of the overarching study before. [BLINDED] described how comparative optimism and moralization were associated with vaccination and vaccination intentions. [BLINDED] reported how various self-uniqueness beliefs were associated with adherence to behavioral precautions. [BLINDED] described to what extent health beliefs predicted morbidity. The data and syntaxes for the present research are available on GitHub. We report all data exclusions.

### Participants

Participants were members (18+) of the Belgian iVox panel, an online panel of a market research and polling agency. We strove for a sample (N = 5000) that was representative for Belgium, region (Brussels Capital Region, Flanders, Wallonia), level of education, age group, and sex. To compensate for attrition, from Wave 2 on, new participants were invited until at least 5000 participants had given informed consent per wave. Table 1 shows the key demographical characteristics. Participants were relatively highly educated as compared to the Belgian population. Some age groups were overrepresented (45-54-years-olds) or underrepresented (65+).

### Design and Context

The 5-Wave longitudinal study took place from December 2020 to May 2021. Individuals were invited for a

subsequent wave about one month after they had participated in a previous one. That entailed that each wave lasted a bit longer as the study progressed. We present the timing and duration of the waves in Table 1.

Before and during our study, the COVID-19 situation in Belgium was as follows. The first major pandemic wave in Belgium had taken place in the Spring of 2020. A lockdown was imposed to mitigate it, during which many major economic sectors were closed (work, school, leisure). After a subsequent trough in the pandemic there was a flare-up in the Summer. A second major wave in the Fall of 2020 led to a second lockdown of a somewhat less stringent nature than the one in the Spring of 2020. Bars, restaurants, non-essential shops, and leisure/cultural businesses had to close, but businesses in other sectors and schools remained open, though with restrictions. This second major wave was largely over by the end of 2020, when an altiplano period began with still considerably more infections than there had been in between the first and the second wave. We collected data for Wave 1 of our study around the end of the second major wave, around the start of the altiplano period (Second half of December 2020, see Table 1). A vaccination campaign began around New Year 2021 and non-essential international travel was banned from late January 2021 to mid-April 2021. We collected data for Wave 2 and Wave 3 of our study during the altiplano period (Wave 2: Mid-January-Early February 2021; Wave 3: Mid-February-Early March). However, a third major wave occurred from March to May 2021. The data collection for Wave 4 of our study happened around the start of that third wave (Mid-March to Mid-April) and the data collection for Wave 5 occurred when it was at its height and then began to wan (Mid-April to Mid-May). The third major wave of COVID-19 fully ebbed away by late June 2021 (i.e., after the end of our study).

**Materials**

We measured optimism and perceived control as the criterion variables, and initial experience (measured in Wave 1 of the study) and time since experience (measured in Waves 2 to 5) as predictors.

**Personal Experience.** We asked participants' personal experience with COVID-19 by asking if they were or had been ill with COVID-19. Participants could pick one answer of five options: "No", "I have (had) symptoms but have not been tested", "Yes, but without hospitalization", "Yes, with hospitalization", "Yes, I have been admitted to Intensive Care".

**Vicarious Experience.** We asked participants' vicarious experience with COVID-19 by asking if anyone they cared about had COVID-19 or had had it. We specified that if participants knew several people in that case, they were to consider the person who meant the most to them. Participants could pick one answer of five options: "No, no one", "Someone I care about has (had) symptoms, but has not been tested", "Yes, but he/she has recovered", "Yes, and he/she still has it", "Yes, and I lost him/her to it"

**Comparative Optimism.** We asked participants to indicate the likelihood that several COVID-19-related events would happen to them and to the average person of their age and gender in the next 3 months. Participants answered on a scale from 0 (this will certainly not happen) to 100 (this will certainly happen). Of the events, two were about infection, two were about severe disease and two were about a good outcome of an infection. We created optimism scores such that higher scores denoted greater optimism (i.e., likelihood estimates for infection and severe disease were reverse-coded). We calculated personal optimism scores and optimism scores for the average other by averaging across events for infection (Cronbach's α at S-Wave 1, this and all subsequent Cronbach's αs before imputation, own = .79; other = 0.90), severe disease (own: α = .93; other: α = .93), and good outcome (own: α = 0.56; other: α = 0.62). We derived comparative optimism scores by calculating self-other differences, and again calculated comparative optimism scores by averaging across events for infection (α = .72), severe disease (α = .79), and good outcome (α = 0.37). We created perceived control scores by again averaging across events for infection (α = .65), severe disease (α = .86), and good outcome (α = 0.73).

**Demographics and risk factors.** We collected various key demographic and health variables. These included participants' age, sex, education level, household composition, region in Belgium, and the urbanization level of their domicile, as well as the presence of risk factors. For details about how these variables were measured, we refer to Appendix 1.

**Procedure**

The survey was presented to participants via the online platform Qualtrics. Potential participants were invited through a link in their iVox account. If they gave informed consent, they got access to the actual survey. The research was approved by [BLINDED NAME ETHICAL COMMITTEE] and the Privacy / Data Protection Officer of [BLINDED NAME OF UNIVERSITY] under number [BLINDED APPLICATION NUMBER].

**Statistical Analysis**

The analysis was conducted using SAS version 9.4 (see code on GitHub). We began by dichotomizing the experience variable (yes/no) rather than maintaining the separate answer options because, in retrospect, the answer options did not unequivocally represent different levels of seriousness. This was particularly true for vicarious experience. Moreover, few participants reported personal experience with COVID-19 (between 14.3% and 15.8% for all levels of experience combined; between 52.5% and 57.2% of the participants reported vicarious experience). Missing values occurred for individuals' personal and vicarious experience with COVID-19. We therefore performed multiple imputation under the assumption that the missingness was at random. This means that the occurrence of missing data could be related to observed variables and criterion values, but not to

the missing values themselves (Molenberghs & Kenward, 2007; Rubin, 1976). Based on this assumption, missing values were imputed 10 times using fully conditional specification methods, utilizing data from all five waves of the study and incorporating all the variables used in this study.

We applied multivariate linear models to each imputed dataset to examine if personal and/or vicarious experience with COVID-19 predicted (comparative) optimism and perceived control. We modelled each optimism variable (i.e., comparative and personal optimism for infection, for severe disease, and for a good outcome) and each control variable (i.e., personal control over infection, severe disease, and a good outcome) separately. As we modelled the five measurements of any given variable simultaneously (i.e., including Wave 1 to 5) the correlation induced by the repeated measurements was taken into account.

The main predictors of interest were, first, the time since the experience with COVID-19, and second, initial experience (i.e., experience reported in Wave 1). We controlled for participants' risk factors, age, sex, educational level, household composition, region and urbanization level of their domicile. The value of the variable 'time since experience' was set to 0 for participants without (personal or vicarious) experience with COVID-19. It was set to 1 when a participant encountered an event and then increased with one unit with each additional wave. To model the relation between time since experience and the predicted variable as flexibly as possible, we treated time since experience as a categorical variable. We combined the results of the models for all ten imputations using Rubin's rules.[1] We used the method of Li et al. (1991) for pooled type III tests of fixed effects.

Concerning time since experience, we first examined if there was an overall effect of experience during the study on the criterion variables. The null hypothesis of this Type III test was that the four coefficients of time since experience were all zero. We followed up on significant effects by testing each coefficient separately. That allowed us to determine at which specific time points since the experience a significant effect occurred.

We also tested whether the potential effect of experience on optimism was mediated by an effect on perceived control. To that end, we repeated the multivariate linear models predicting (comparative) optimism, including the lagged values of control as an additional predictor.

## Results

[1] Under Rubin's rules, the degrees of freedom depend on the average variance of parameter estimates of imputations and the variance of the estimates between imputations. They can thus vary from test to test even if the same predictor is involved (Rubin, 1987).

We here report results for the overall multivariate linear model per measure of optimism and perceived control. The overall statistical information is in Table 2. The main predictors were initial experience as reported during the first wave of the longitudinal study and, particularly, time since experience during the six months that the study lasted. To enhance readability, we will henceforth shorten the names of these variables to 'initial experience' and 'novel experience'. We report results for the models allowing the identification of the precise time lags at which novel personal and vicarious experience affected the various types of optimism and perceived control in Appendix 2 in the Supplemental Materials (see Tables S2.1 to S2.24).

**Likelihood of infection.** Initial personal experience was associated with lower comparative optimism. It was associated with both lower personal optimism and lower optimism for others, but the former effect was stronger than the latter. When initial experience was controlled for, we did not observe any effect of novel personal experience on comparative optimism. However, novel personal experience reduced personal optimism while leaving optimism for others unaffected.

Initial vicarious experience was also associated with lower comparative optimism, lower personal optimism,; and lower optimism for others; the former effect again being stronger than the latter. When initial experience was controlled for, novel vicarious experience did not affect comparative optimism. It reduced personal optimism, an effect that lasted even longer than the effect of personal experience, but it also reduced optimism for others.

**Likelihood of severe disease.** Initial personal experience was associated with *greater* comparative optimism. It was not associated with personal optimism; but it was associated with lower optimism for others. When initial experience was controlled for, we did not observe any effect of novel personal experience on comparative optimism, personal optimism, or optimism for others.

Initial vicarious experience was not related to comparative optimism, but it was associated with *greater* personal optimism and *greater* optimism for others. When initial experience was controlled for, we did not find any effect of novel vicarious experience on comparative optimism, personal optimism, or optimism for others.

**Likelihood of good outcome.** We did not find any significant associations between initial personal experience and comparative optimism, personal optimism, or optimism for others. When initial experience was controlled for, we did not observe any effect of novel personal experience on comparative optimism. However, novel personal experience *enhanced* personal optimism while leaving optimism for others unaffected.

Initial vicarious experience was also not associated with greater comparative optimism. However, it was associated with greater personal optimism and greater optimism for others. When initial experience was

controlled for, we did not observe any effect of novel vicarious experience on comparative optimism. Still, novel vicarious experience enhanced personal optimism while leaving optimism for others unaffected.

Because of the low reliability of optimism for a good outcome, we performed a principal component analysis to investigate the appropriateness of combining the items, and calculated the correlation between the scores extracted from the first principal component and the original composite score. Details and results are provided in Appendix 4 (Supplemental Materials). The high correlation suggests that the original composite score, optimism for a good outcome, captures most of the underlying variability, and can be used as a valid summary measure.

**Perceived control.** We found no evidence that initial experience with COVID-19 was associated with differences in perceived control over the likelihood of infection, regardless of the experience being personal or vicarious. However, when initial experience was controlled for, novel personal experience with COVID-19 reduced perceived control over the likelihood of infection, as did novel vicarious experience.

Initial personal experience was associated with *more* perceived control over the likelihood that an infection would entail severe disease whereas initial vicarious experience was associated with *reduced* perceived control over the likelihood that an infection would entail severe disease. When initial experience was controlled for, novel personal experience with COVID-19 reduced perceived control over the likelihood that an infection would entail severe disease, as did novel vicarious experience.

Initial personal experience was also associated with *more* perceived control over the likelihood that an infection would have a good outcome. Initial vicarious experience was not associated with more or less perceived control over a good outcome. However, when initial experience was controlled for, novel personal experience did not affect perceived control over a good outcome; whereas novel vicarious experience reduced perceived control over a good outcome.

**Mediation of effects on optimism by effects on perceived control.** To assess whether the observed significant effects of novel experience on personal optimism and optimism for others were mediated by effects of novel experience on perceived control, we refitted the involved models including the relevant perceived control variable. The relevant perceived control variable was the perceived control variable that corresponded with the involved optimism variable (e.g., perceived control over infection in the analysis of personal optimism regarding infection). As we measured perceived control in all five waves, we fitted models with control at varying lag values. All effects of vicarious and personal experience remained significant, with the exception of personal optimism regarding a positive outcome with control lags 2 and 3. Thus, we did not find evidence that the observed effects on personal optimism and optimism for others were mediated by effects on perceived

control. We report the statistical details of this analysis in the Supplemental Materials (Appendix 3; Table S3.1).

**Sensitivity analysis.** As noted in the section 'Statistical analysis', we conducted our analyses under a MAR assumption. We do believe that this assumption was justified (e.g., individuals who were reluctant to answer question because they were suffering from COVID-19 were likely not to participate at all rather than to participate and skip certain questions), but we still conducted a sensitivity analysis under a Missing Not at Random (MNAR) assumption. Most outcomes were unchanged. A few significant effects (just) lost statistical significance. Among those were the effect of initial personal experience on comparative optimism regarding severe disease ($p$ = .193), the effect of novel personal experience on personal optimism regarding mild outcomes (p = .054), and on perceived control over infection ($p$ = .061) and severe disease ($p$ = .058), and the effect of initial vicarious experience on comparative optimism concerning infection (p = .097), personal optimism concerning a mild outcome (p = .092) and perceived control over severe disease (p = .183). The effect on perceived control of severe disease reversed in direction but remained significant (p = .001). One originally non-significant effect became significant: the effect of novel experience on optimism for others concerning severe disease (p = .027). For more details about the sensitivity analysis, see Appendix 5 in the Supplemental Materials.

## Discussion

We did not find evidence for changes in comparative optimism concerning the likelihood and the expected outcome of an infection after recent personal or vicarious experience with COVID-19. Admittedly, a null finding does not prove the absence of an effect. Moreover, the null finding might seem at odds with earlier studies that have found a negative relationship between comparative optimism and experience with various hazards (Helweg-Larsen & Shepperd, 2001; Shepperd et al., 2003; Trumbo et al., 2014; Ucbasaran et al., 2010; Weinstein, 1980).

However, two elements of our research speak to the meaningfulness of us not finding a change in comparative optimism after recent experience. One element is that we did, at the cross-sectional level, find a negative correlation between comparative optimism concerning the likelihood of infection and both personal and vicarious earlier experience. We thus replicated an often-reported pattern even though the hazards that were studied in earlier research markedly differed from COVID-19, which was at the time of our study still a novel disease with many unknown characteristics. The other element is that recent experience was accompanied by changes in optimism and perceived control. Personal experience entailed lower personal optimism concerning the likelihood of infection and higher personal optimism concerning the likelihood that an infection would have a good outcome. It also entailed lower perceived control over the likelihood of infection and the likelihood that

an infection would entail severe disease. Vicarious experience entailed similar changes, plus lower optimism concerning the likelihood that other would get infected and lower control attributed to others over the likelihood that an infection would have a good outcome. It seems, therefore, that our study was adequately powered. Moreover, our analysis controlled for many demographic characteristics.

These findings are interesting for several reasons. First, they show that not observing a statistically significant effect of recent experience on comparative optimism should not be taken as an indication that recent experience does not entail any change in risk perception at all. Change may occur in people's expectations concerning their personal vulnerability without that also entailing a significant change in their expectations about their comparative vulnerability. That may be the case, for instance, if people's expectations concerning other people's vulnerability change in the same direction (even if that change is not significant).

Second, it has long been assumed that comparative and personal optimism are closely related to feelings of control (Harris et al., 2008; Klein & Helweg-Larsen, 2002; Kos & Clarke, 2001; Weinstein, 1980). Our finding that experience with COVID-19 was followed by both reduced perceived control over, and reduced personal optimism concerning infection is consistent with that view. However, our findings suggest that the relationship between perceived control and optimism may be more complicated than once thought (cf. Harris & Middleton, 1994). For example, reduced perceived control over severe disease after recent personal experience did not go hand in hand with reduced personal optimism or optimism for others. Nor did enhanced personal optimism concerning a good outcome go hand in hand with enhanced perceived control. Recent vicarious experience even went accompanied by *reduced* perceived control over a good outcome. Finally, we did not find evidence that perceived control mediated the relationship between experience and optimism.

The finding that recent personal experience enhanced participants' personal optimism concerning a good outcome is consistent with earlier findings on personal experience with natural hazards. For example, individuals who reported a lot of experience with natural disasters such as lightning storms and strong earthquakes were more optimistic concerning their personal risk of getting killed in such a disaster than individuals who reported limited experience with them (Halpern-Felsher et al., 2001). The explanation may be that these individuals have learned that even great hazards are not necessarily fatal. In our study, the mere fact that participants were capable of participating in the study despite a recent experience with COVID-19 suggests that they may have suffered relatively mild or short episodes of the disease. At first glance, therefore, the finding is not very existing. However, it may have substantial implications. The more experience people have with a hazard, the more invulnerable they may feel for severe outcomes of future occurrences. If future occurrences are more dangerous

(e.g., if a new and more dangerous type of the illness emerges), that tendency may entail reckless risk-taking. We return to this point in the implications section.

**Strengths**

We used a longitudinal design that allowed us to examine if recent personal and vicarious experience with COVID-19 affected personal and comparative optimism. Thus, our research did not suffer from recall distortions that might complicate conclusions to be drawn from retrospective studies, nor from the interpretational ambiguity surrounding correlational studies using a cross-sectional design (Weinstein & Nicolich, 1993). We also used a large sample, which was more representative for the general population than many earlier studies on the effect of experience on personal and comparative optimism. For example, many of these studies used student participants (e.g., Burger & Palmer, 1992; Helweg-Larsen, 1999; Shepperd et al., 2003) or convenience samples (e.g., Sylvestre et al., 2023).

At the time of our study, COVID-19 was a hazard that was eminently well-suited to study the effects of prior experience on comparative optimism. More specifically, it was relatively new, such that none of the participants could have had an extended history of it in the more distant past. Thus, long-standing individual differences could not create the type of noise that could be present in the data of many other studies where the experience variable often represents the relative recency rather than the relative presence of experience. For example, studies on the effects of experience with hurricanes and earthquakes are typically conducted in regions where such natural disasters have frequently happened in the past (e.g., Helweg-Larsen, 1999; Trumbo et al., 2014).

A final strength of our research that we wish to highlight here was that we distinguished between personal and vicarious experience. Thus far, only a handful of studies have tried to disentangle their effects (Cho et al., 2023; Katapodi et al., 2010; Roe-Berning & Straker, 1997). We found strong evidence that experience does not need to be first hand to entail changes in people's personal risk perception. Vicarious experience did so at least as much as personal experience. Also importantly, we found some degree of egocentric asymmetry in the effects of experience with COVID-19. In the absence of any such egocentrism, one would expect that personal experience would be more strongly associated with changes in personal optimism and that vicarious experience would be more strongly associated with changes in optimism for others. That was not the pattern that we observed. A case where egocentrism was particularly evident was the case of optimism concerning the likelihood of infection. Earlier personal and vicarious initial experience were both more strongly associated with personal optimism than with optimism for the average other. Moreover, recent personal experience entailed a reduction in personal optimism and not in optimism for the average other whereas recent vicarious experience entailed a

reduction in *both* personal optimism and optimism for the average other. Another case where egocentrism was evident was the case of optimism concerning one's own likelihood of a good outcome. Recent personal experience was associated with enhanced personal optimism, with optimism for other people unaffected. In sum, both vicarious and personal experience were more generally associated with personal optimism than with optimism for the average other.

Our study thus contributes to the thus far very limited evidence concerning the locus of the effect of personal versus vicarious experience. Our results are consistent with those of a study where adolescents who merely knew victims of crime gave higher estimates of societal crime rates *and* were less optimistic concerning their own risk of victimization, whereas adolescents who had personally fallen victim to a crime were less optimistic concerning their risk of victimization but did not estimate societal crime rates to be higher (Tyler, 1980, Study 2). However, they are inconsistent with the findings of another study, where adolescents who reported personal experience with traumatic incidents (e.g., accidents, crimes) were less optimistic for themselves *and* the average peer concerning future occurrences, whereas those who reported vicarious experience were less optimistic for the average peer only (Roe-Berning & Straker, 1997).

**Limitations**

We measured experience and optimism through self-reports. That was unavoidable, as there was no systematic testing of the whole population in Belgium and it would not have been possible to organize testing for the purpose of our study. One implication is that we cannot rule out social desirability concerns completely. However, earlier studies on changes in optimism after experience with negative events also typically used self-reports (see, for instance, the studies reviewed in Helweg-Larsen & Shepperd, 2001) so that our approach was comparable with the approach in earlier research.

The attrition between the waves of our study was relatively modest for a longitudinal study spanning six months in stressful public health circumstances, and we have applied top-notch techniques to limit the impact of that attrition. However, there is no ideal solution for the attrition issue. We therefore must recognize it as a limitation for our research, as it is for any longitudinal research.

The unavoidable dichotomization of the variables denoting personal and vicarious experience with COVID-19 implied that we could not differentiate between levels of severity of experience. However, most participants who reported experience must have experienced relatively mild cases of the disease. Thus, caution is needed when trying to generalize our findings to individuals who had suffered, or whose significant others had suffered, from very serious illness or very long-lasting symptoms. Whereas we consider that a limitation of our research, it

also renders our findings representative for the vast majority of people surviving an infection with the coronavirus of whom only a small minority lands in hospital, and a minority of those in an ICU.

One limitation of one of our measures was the low internal consistency of our measure of comparative optimism for a good outcome. If anything, however, low internal consistency limits the strength of the associations that can be observed. It thus implies that the relationship between experience and personal and comparative optimism for a good outcome might be even more impressive than our statistical tests suggest.

**Implications**

Our findings have methodological implications for research on comparative optimism and risk perception concerning infectious diseases. As we explained in the introduction, there are two main approaches for measuring comparative optimism: the direct and the indirect approach (Aucote & Gold, 2005; Covey & Davies, 2004; Rose, Suls, & Windschitl, 2011). The direct measure involves asking people to provide risk estimates for themselves as compared to their peers. The indirect measure involves asking people to provide risks for themselves and for others or for the average other and examining the difference between the two. Our findings suggest that it is wise to measure comparative optimism through the indirect method because it allows researchers to distinguish between personal optimism and comparative optimism. If an assumed determinant affects comparative optimism, the indirect method allows researchers to examine if that determinant affects likelihood estimates for the self or for others. Perhaps even more importantly, as in the case of our study, using the indirect method helps understanding null effects by allowing researchers to distinguish between cases where no effect at all occurs and cases where risk perception or risk perception for others are affected, without this entailing an effect on comparative optimism. Admittedly, the observed comparative optimism is a linear combination of personal optimism and optimism for others. Thus, the analyses are not totally independent. It might seem that independent measures of comparative and personal optimism could have been achieved by using the direct measurement approach and likelihood estimates for the self. However, earlier research has shown that relative likelihood estimates tend to be strongly correlated with self-judgments and only weakly so with other-judgments (e.g., Chambers, Windschitl, & Suls, 2003; Eiser, Pahl, & Prins, 2001), a finding suggesting that comparative optimism as measured through the indirect approach is more independent from personal optimism than comparative optimism as measured through the direct approach.

The finding that optimism concerning different aspects of COVID-19 changed in opposite directions after recent experience with COVID-19 substantiates the view that research on risk perception concerning infectious diseases like COVID-19, influenza and SARS, should systematically distinguish between the risk of infection

and the potential outcomes of an infection. Earlier research on risk perception concerning infectious diseases did not systematically distinguish between the perceived risk of infection and the perceived risk of severe disease, let alone between the risk of severe disease and the likelihood of a mild outcome (Tagini et al., 2021). Research on COVID-19 has shown that these aspects provoke different levels of comparative optimism and are to different extents perceived as being personally controllable (e.g., Asimakopoulou et al., 2020; De Witte et al., 2023; Hoorens et al., 2022). We now found that perceptions of the likelihood of infection and of a potential outcome of an infection changed in opposite directions after experience with COVID-19.

At a more applied level, our findings show that evidence-based public health communication might profit from research that clearly distinguishes between the different aspects of health risks. That particularly holds true for messages that remind people of their personal or vicarious experience with the health hazard at stake. To the extent that risk and preventative behavior depend on the perceived risk of infection, reduced personal optimism after experience with COVID-19 suggests that people who have suffered from the disease in the recent past or who know others who have suffered from it may be more open to health communication. Thus, mass health communication messages about the risk of infection may gain effectiveness if it provides people with vivid examples of patients whom they can identify with. In contrast, reminding people of their own earlier infections may not be as effective, at least not in mass health communication, for two reasons. First, it may reinforce people who have not experienced the illness in their assumption that their personal risk is quite low. Second, people who have suffered a relatively mild case of the illness may have become more optimistic concerning how bad an infection actually would be and therefore do not really bother about the risk of infection that much.

## Conclusion

Both recent personal and recent vicarious experience with COVID-19 entailed reduced optimism concerning one's own likelihood to get infected in the future, but enhanced optimism concerning a good outcome of such an infection. Only vicarious experience with COVID-19 entailed reduced optimism concerning other people's likelihood to get infected in the future. These changes in personal optimism did not entail a significant change in comparative optimism and were not mediated by changes in perceived control.

## Conflicts of interest

We, the authors, have no known conflicts of interest to disclose.

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