*Multiple group membership, optimistic bias and infection risk in the context of emerging infectious diseases*

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## Abstract

BACKGROUND: Understanding psychosocial factors which impact responses to emerging infectious diseases (EIDs) is vital in managing epidemics and pandemics. Two under-researched areas in this field are the interactive roles of optimistic bias (underestimation of the likelihood of negative events occurring to the self, relative to others) and group membership (a factor observed to be psychologically protective, but infection risk enhancing). AIMS: The current study aimed to test the relationships between optimistic bias and membership of multiple groups upon EID related emotional and psychological responses and behavioural intentions. METHODS: Participants from the UK and US (N= 360) rated how they would evaluate and respond to a fictitious EID immediately before the 2020 COVID-19 lockdowns in a correlational study. RESULTS: Negative relationships were observed between optimistic bias and perceived infection vulnerability, infection prevention strategies and perceived EID severity. Multiple group membership correlated negatively with germ avoidance, but positively with emotional responses such as disgust and increased perceived vulnerability to infection – factors linked to avoiding infection. Multiple group memberships and optimistic bias were unrelated. LIMITATIONS: The study focussed on a fictitious disease and relies on cross-sectional data and behavioural intentions. CONCLUSIONS: These findings build upon the small evidence base on the role of optimistic bias in EID management and suggest that multiple group membership is unlikely to increase optimistic bias. The theoretical and practical implications of the findings for EID management are discussed.

Keywords: groups; pandemic; communicable diseases, emerging; covid-19;

optimistic bias; unrealistic optimism

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Individuals’ attitudes and behaviours around illness susceptibility and prevention are key for reducing the impact of rapidly spreading emerging infectious diseases (EIDs) such as COVID-19, Zika, SARS and H1N1 (Boyd, Gazmararian, & Thompson, 2013; Deurenberg-Yap et al., 2005; Leung et al., 2003; Mouchtouri et al., 2017; Painter, Plaster, Tjersland, & Jacobsen, 2017; Vírseda et al., 2010). It is important to have a clear understanding of psychosocial factors which affect individuals’ beliefs around infection risks and willingness to engage in preventive control measures. The current study tested the relationships between a factor shown to be protective of mental health in other domains (multiple group membership), a health belief linked to health behaviours (optimistic bias, the belief that one is more likely to achieve positive outcomes and avoid negative outcomes than similar others; Klein & Helweg-Larsen, 2002) and psychological responses which are argued to assist pathogen exposure avoidance (i.e. emotional responses to infected/potentially infected others, beliefs around vulnerability, likelihood of adhering to physical distancing and other control/prevention behaviours see e.g. Cruwys, Stevens, & Greenaway, 2020; Schaller, 2011; Schaller & Park, 2011).

### Multiple group membership as a protective factor?

Research from the social identity approach suggests that having social connections with others is linked to a variety of positive mental and physical health outcomes, in a diverse range of domains and populations (see Jetten, Haslam, & Haslam, 2012). Membership of, and identification with, specific social groups is often linked to higher levels of health related efficacy (belief one can achieve one’s goals, e.g. Frings & Albery, 2017), and recovery from mental health difficulties (such as depression, e.g. Cruwys, South, Greenaway, & Haslam, 2015). In the context of EIDs, community groups (such as religious organisations) are often a key mechanism for disseminating accurate health advice in an authoritative manner (e.g., during Ebola responses, see Santibañez et al., 2015).

While multiple group memberships may be generally beneficial in terms of mental health and during times of stress and transition (see Bule & Frings, 2016; Dingle, Ingram, Haslam, & Kelly, 2019; Gleibs et al., 2011; Haslam, Cruwys, Haslam, Dingle, & Xue-Ling, 2016; Jones & Jetten, 2011), they may have specific paradoxical impact in terms of epidemic EIDs. Multiple group memberships are thought to function in part by increasing social capital (resources made available through social others, Häuberer, 2011). While generally beneficial, they can also have negative effects such as behavioural contagion (risk related behaviours adopted by one group member may be transmitted by others), informal social control encouraging negative behaviours and a downgrading of effort levels related to positive behavioural engagement to match other group members (Portes, 1998; Villalonga-Olives & Kawachi, 2017). The latter could include a proliferation of non-adherence to control measures, reduced effort in maintaining them, and/or active social pressure *against* precautionary or preventive behaviour engagement. For instance, in health research, having a wide social network (a concept related to, but different from, identifying with multiple groups) has also been linked to higher engagement in risky behaviours (such as drinking or dangerous driving) and lower health prevention behaviours (such as regular walking) (Caspi, Kawachi, Subramanian, Tucker-Seeley, & Sorensen, 2013; Obeid, Gitelman, & Baron-Epel, 2014; Takakura, 2015). This may be because having a wider social network buffers the risk of infection by increasing the chance of peer healthcare provision (Sugiyama, 2004). In the context of COVID-19, group norms (along party political lines) have also been shown to both increase and decrease physical distancing (Allcott et al., 2020). Similarly, to the extent to which identification with a single group encourages a sense of trust, safety, efficacy and control, they also make individuals feel less at risk of infection (Cruwys et al., 2020), which may impact their willingness to engage not only in physical distancing, but also other prevention measures. We examine these issues in relation to a psychological process which influences health behaviours - *optimistic bias*.

### Optimistic bias, social identity and illness

Optimistic bias (underestimation of the likelihood of negative events occurring to the self vs. others) appears to be highest when people perceive they have control over the events in question (Klein & Helweg-Larsen, 2002), when the event is more severe (Harris, Griffin, & Murray, 2008) and when the event is personally relevant to the individual (see McKenna & Albery, 2001). Some, but not all, research around optimistic bias suggests it is a barrier to engaging in risk prevention behaviour (see Barnoy, Bar-Tal, & Treister, 2003; Hanoch, Rolison, & Freund, 2019; Kim, Choi, & Choi, 2006; Park, Lee, & Ham, 2008; Rutter, Quine, & Albery, 1998; Shepperd et al., 2017; Weinstein & Lyon, 1999; cf. Taylor & Gollwitzer, 1995). Other factors that have been shown to covary with the level of unrealistic optimism for a health threat are one’s experience or involvement with the threat (Burger & Palmer, 1992; McKenna & Albery, 2001; Trumbo, Lueck, Marlatt, & Peek, 2011), and the temporal proximity of an event (see Sweeny & Krizan, 2013). In terms of the latter, it has been shown that more temporally distant events are processed in a more abstract way while immediate ones are processed in a more reflective, deliberative and concrete manner (Nussbaum, Liberman, & Trope, 2006; Zhao & Peterson, 2017). One explanation for this effect is that individuals will mentally contrast perceived future outcomes of an event with current barriers or obstacles they see as preventing that outcome, and that the result of this is increased or decreased optimistic bias (Sevincer, Schlier, & Oettingen, 2015). In the context of a flu-like epidemic virus (H1N1), Cho, Lee, and Lee (2013) showed that optimistic bias is both present and resilient to change, but also that it does not have a direct effect on risk behaviour (rather, via moderation of the efficacy of interpersonal communication). Optimistic bias was seen to be present in a variety of samples during the COVID-19 outbreak (e.g. Dolinski, Dolinska, Zmaczynska-Witek, Banach, & Kulesza, 2020; Druică, Musso, & Ianole-Călin, 2020).

Although little work has directly addressed links between multiple group memberships, optimistic bias and disease outcomes, some related work is supportive of a potential set of relationships. Sharing a group membership with another person seems to affect optimistic bias in the context of disease – for instance as discussed above, we feel less likely to be infected by ingroup members (Cruwys et al., 2020; Schaller, 2011). However, it should also be noted that group membership is not always linked to increased optimistic bias or related effects. For instance, framing negative events as occurring to those that are in a group with the influence target has been shown to decrease optimistic bias in health communications (Harris, Middleton, & Joiner, 2000; Perloff & Fetzer, 1986).

*Summary and hypotheses*

We argue that multiple group membership may be linked to optimistic bias and subsequently to epidemic EID control related outcomes. In the current study, participants were presented with information about a fictitious EID (‘2020:CRH-4X’). We chose to use a fictitious disease to better test the role of optimistic bias which has been shown to be lower when people are contemplating a real outbreak (see De Zwart et al., 2009). Moreover, multiple group memberships increase levels of control and self-efficacy (Pidgeon, Kasperson, & Slovic, 2003; Poortinga, Bickerstaff, Langford, Niewöhner, & Pidgeon, 2004) but these may both lower when people are faced with the temporally close SARs-Cov-2 pandemic (perhaps indirectly indicated by high levels of anxiety oberved at a population level during this time, see e.g. Nikčević and Spada, 2020). We selected outcome variables associated with EID related psychological responses, including infection avoidance related emotions (e.g. disgust), perceived vulnerability to disease, desire to avoid germs and perceived disease severity and measured individuals’ willingness to engage in control/prevention behaviours in response to the EID.

Our hypotheses (pre-registered on the Open Science Framework see <https://osf.io/43yxv/>) are as follows. Given previous work has shown that multiple group membership provide a sense of efficacy, confidence and security, we hypothesised that multiple group membership will be positively related to both optimistic bias and the outcomes listed above. Given previous literature links optimistic bias to health-related beliefs and behaviours, we also hypothesise that optimistic bias will have a direct effect on these outcomes, but also that optimistic bias will mediate the possible effects of multiple group membership.

## Methods

### Participants

A sample of 396 participants was recruited, with 381 completing the measures. Of these, due to a technical error, n = 21 were not shown a description of the virus and were not included in the analysis, leaving a final n of 360. Participants were aged between 18 and 70 years (M = 35.39, SD = 11.00). 62.8% identified as female, 36.4% identified as male and 0.8% as other gender. 70.8% were UK residents, 21.7% US residents, n = 2 resided in Germany and single participants resided in Poland, South Korea, Ireland, the Netherlands and Denmark. In terms of ethnicity, 85.3% described themselves as White, 1.4% as Hispanic/Latino or Latina, 3.3% as Black or Black African, 7.2% as Asian, 0.3% as a Native Hawaiian or Pacific Islander, and 2.5% as ‘Other’. In terms of social economic status, 50% described themselves as working class, 49.2% as middle class and 0.8% as upper class.

## Materials

#### Emotional responses. Emotional response was measured using a 7-point Likert scale ( anchored at 1 = not at all and 7 = very much) in response to the following question: ‘Imagine you met someone who had 2020:CRH-4X. To what extent would you feel?’ followed by the following emotions; Disgust, anxiety, sympathy (R), repulsion, worry, compassion (R), dislike, fear and empathy (R). Items marked (R) were reverse coded. Internal scale reliability was good, Cronbach’s α = .81

Infection avoidance strategies. On the basis of face validity, strategies were adapted from Sadique et al.'s, (2007) study on precautionary actions for an influenza pandemic[[1]](#footnote-2) and new items devised on the basis of other public health responses to EDIs. Responses were measured using 7-point Likert-type scales (1 = not at all likely,7 = very likely) in response to the following question; ‘*2020:CRH-4X infection risk can be reduced by taking a number of precautions. How likely would you be to take each of the following precautions if the disease had infected 10% of your local community population?*’. Items were: ‘*avoid food cooked by other people’*, ‘*avoid public places where possible’*, ‘*avoid contact with people who may have been exposed to others with the virus’, ‘avoid contact with animals’, ‘wear a facemask in public’, ‘wear gloves in public’, ‘stay indoors when at all possible’, ‘avoid contact with medical professionals’* and *‘avoid use of public transport’*. As these items comprised a new scale, the data were subjected to a factor analysis with oblimin rotation (as we had no assumptions as to possible orthogonality of emerging dimensions). This yielded two factors (see Table 1), one we interpreted as reflecting *physical distancing*, a second we interpreted as reflecting *active control measures*. One item (avoid contact with animals) was dropped from the scale as it did not load onto either factor.

*\*Table 1 here \**

Optimistic bias. OB was measured using two items on 7-point Likert-type scales (1 = not at all likely,7 = very likely) in response to the following question ‘*How likely do you think [the average person in your local community/you] would be to catch 2020:CRH-4X if it spread in your country*?’ To calculate OB, the ‘you’ item was subtracted from ‘average’ person. Thus, higher scores represent increased likelihood of similar others being infected relative to the self.

Multiple group memberships (Haslam et al., 2008). MGM was measured using the mean of 4 items on 7-point Likert scales (1 = do not agree at all 7 = agree completely). The items were: *I belong to lots of different groups, I join in with the activities of lots of different groups, I have friends who are members of lots of different groups* and *I have strong ties with lots of different groups*. Higher scores represent higher levels of multiple group membership. Internal reliability of the scale was Cronbach’s α = .93.

Perceived vulnerability to disease (Duncan, Schaller, & Park, 2009). Measured using the mean of 15 items on 7-point Likert scales (1 = strongly disagree, 7= strongly agree). The PVD scale comprises two subscales — one measuring perceived vulnerability to infection (i.e. *If an illness is 'going around', I will get it*) and one measuring germ avoidance (i.e. *I prefer to wash my hands pretty soon after shaking someone's hand*). Cronbach’s αs were acceptable for perceived vulnerability to infection (α = .70) and germ avoidance (α = .75).

*Perceived disease severity.* Measured using two items on 7-point Likert scales(1 = extremely unlikely, 7 = extremely likely). The items were: *If you caught 2020:CRH-4X, how likely do you think you would be to make a full recovery?* and *If you caught 2020:CRH-4X, how likely do you think you would be to have serious medical complications?*‘. The former was reverse coded and a mean scale calculated with higher scores indicating higher severity. These items correlated *r* = .52, *p* < .001.

Demographics. The following were recorded; age, gender, country of residence, country of origin, highest level of education, ethnicity, social class (using the method adopted in Jetten, Iyer, Tsivrikos, & Young, 2008), perceived regularity of self being ill and history of serious disease.

### Procedure

Participants were recruited via Prolific, an online data collection platform ([www.prolific.co](http://www.prolific.co).) and the questionnaire was hosted via Qualtrics (www.qualtrics.com). Data collection took place on 18th March 2020 – during this period physical distancing and other responses to the 2020 COVID-19 pandemic (such as school closure) were expected but had not been enforced in the UK or US. Participants were screened for inclusion on basis of a; being a US or UK resident and b; being able to complete the questionnaire via a tablet or desktop device. The questionnaires were estimated to take around 16 minutes (prior to launch), and participants were offered an equivalent of ~GBP£13 (~USD$16) per hour incentive. After consent was obtained, participants read the description of an EID, purportedly drawn from an epidemic alert system. The virus, named ‘CRH-4X’, was described as initially consisting of *a moderate fever which passes within 24 hours. Following this, those carrying the disease may be symptom free for up to week, but can still pass on the virus. Symptoms reappear with the emergence of characteristic minor reddening of the edge of the eye and the individual may feel short of breath. Lung problems (‘honeycombing’) and other respiratory complications can occur. These can be fatal.* This was accompanied by information about how the virus spreads, how contagious it is, the initial source of the virus into the country and other information (see supplementary material for full descriptor).[[2]](#footnote-3) Participants were told there would be a memory test at the end of the study and then asked to complete the scales in the order they are described above. Finally, they were debriefed, including a reminder that the virus described, and the ‘alert system’, were both fictitious. The full dataset also contains other measures which were collected at the same time – full details can be found at <https://osf.io/43yxv/> .

**Ethics statement:** The study received ethical approval from London South Bank University Ethics Panel, ethical application number ETH1920100. All participants gave informed consent to take part in the research.

## Results

In line with our pre-registered protocol, participants falling three or more standard deviations from the mean on a given variable were excluded on an analysis by analysis basis (where that variable was featured). Outlier screening was employed as regression-based models (which the planned analyses comprised) are sensitive to outliers. Statistical models were created using the PROCESS macro (V3.4) in SPSS (Hayes, 2017). In each case, the direct effects of multiple group membership upon the outcome variable (indicated by coefficient ‘*a1*’) and the mediator (‘*b1*’ – optimistic bias) were calculated, as was the relationship between the mediator and the outcome (‘*c1’*’) and indirect (mediation) effect via optimistic bias (‘*a1b1*’). 5000 bootstrap samples were taken, and 95% confidence intervals were tested. Descriptive statistics can be found in Table 2.

*\*Table 2 here\**

Emotional responses. The overall model was not significant, *R*2 = .02, *F* (2,353) = 2.81, *p* = .061. Multiple group membership related positively to perceived responses (*a1* = .07, *t* = 2.23, *p* = .026, CIs = 0.10, 0.13), but did not relate to optimistic bias (*b1* = -0.03, *t* = 1.01, *p* = .313, CIs = -0.10, .03). Levels of OB were not linked to emotional responses (*c1’* = -0.03, *t* = 0.67, *p* = .504, CIs = -0.13,0.07). The indirect effect of multiple groups via optimistic bias was not significant (*a1b1* = .001, 95% CIs = -0.0032, 0.0072). No change in the pattern of results was observed when differences in description were controlled for (see *Footnote 2*, above). In sum, multiple group memberships were related to increased emotional responses, but optimistic bias was not, and no mediation was observed.[[3]](#footnote-4)

Perceived vulnerability to infection. The overall model was significant, *R*2 = .04, *F* (2,355) = 7.85, *p* = < .001. Multiple group membership related positively to perceived vulnerability to infection (*a1* = 0.06, *t* = 1.97, *p* = .0497, CIs 0.01, 0.11), but did not relate to optimistic bias (*b1* = -0.03, *t* = 1.05, *p* = .292, CIs= -0.10, 0.03). Higher levels of OB were associated with decreased infection vulnerability *c1’* = -0.16, *t* = 3.32, *p* < .001, CIs = -0.25, -0.06). The indirect effect of multiple groups via optimistic bias was not significant (*a1b1* = < 0.01, 95% CIs = -0.0057, 0.0178). No change in the pattern of results were observed when differences in description were controlled for. In sum, multiple group membership was linked to increased perceived vulnerability, while higher optimistic bias was related to a decreased perception, and no mediation was observed.

Germ avoidance.The overall model was significant, *R*2 = .03, *F* (2,355) = 4.69, *p* = .010. Multiple group membership related negatively to germ avoidance (*a1* = -0.10, *t* = 3.06, *p* < .001, CIs = -0.17, -0.04), but did not relate to optimistic bias (*b1* = -.03, *t* = 1.05, *p* = .292, CIs = 0.10, 0.03). Levels of OB were not significantly linked to decreased germ avoidance *c1’* = -.10, *t* = 0.14, *p* = .887, CIs -0.012, 0.10). The indirect effect of multiple groups via optimistic bias was not significant (*a1b1* = < .01, 95% CIs = -0.005, .0064). No change in the pattern of results were observed when differences in description were controlled for. In sum, multiple group memberships were related to decreased germ avoidance, but optimistic bias was not related, and no mediation was observed.

Infection prevention strategies: The overall model was significant, *R*2 = .03, *F* (2,355) = 4.58, *p* = .011. Multiple group membership was unrelated to infection avoidance (*a1* = 0.06, *t* = 1.08, *p* < .283, CIs -0.05, 0.16), and optimistic bias (*b1* = -.03, *t* = 1.05, *p* = .292, CIs= -0.10,0.03). Higher levels of OB were linked to decreased infection avoidance (*c1’* = -.24, *t* = 2.77, *p* = .006, CIs= -.42, -.07). The indirect effect of multiple groups via optimistic bias was not significant (*a1b1* = < .008, 95% CIs = -0.0077, 0.0029). No change in the pattern of results were observed when differences in description were controlled for. In sum, multiple group memberships were not related to prevention strategy intention, but optimistic bias was linked to a reduction in intentions. No mediation was observed.

Physical distancing: The overall model was not significant, *R*2 < .01, *F* (2,352) = 1.17, *p* = .311. Multiple group membership was not related to physical distancing intentions (*a1* = -0.03, *t* = 1.00, *p* = .318, CIs = -0.10,0.03), and optimistic bias (*b1* = -.03, *t* = 1.00, *p* = .316, CIs= -0.09, 0.03). OB was not linked to physical distancing (*c1’* = -.06, *t* = 1.11, *p* = .270, CIs = -0.05, 0.16). The indirect effect of multiple groups via optimistic bias was not significant (*a1b1* = < .01, 95% CIs = -0.0121, 0.0037). No change in the pattern of results were observed when differences in description were controlled for. In sum, neither multiple group membership nor optimistic bias was linked to physical distancing.

*Perceived disease severity.* The overall model was significant, *R*2 =0.03, *F* (2,354) = 5.51, *p* <.005. Multiple group membership was unrelated to perceived severity (*a1* = -0.01, *t* = 0.35, *p* = .72, CIs -0.05, 0.08), and optimistic bias (*b1* = -.04, *t* = 1.13, *p* = .26, CI-.10, .03). OB was negatively related to severity (*c1’* = -.19, *t* = 3.27, *p* = .001, CIs -.31,-.08). The indirect effect of multiple groups via optimistic bias was not significant (*a1b1* = < .01, 95% CIs = -.0059, .0223). No change in the pattern of results were observed when differences in description were controlled for. In sum, multiple group membership was not related to perceived severity, while higher optimistic bias was linked to decreased severity. No mediation was present.

### Discussion

Previous research linking optimistic bias to responses to emerging infectious diseases (EIDs) has observed mixed effects. Furthermore, none have looked at relationships between multiple group memberships (generally linked to positive health-outcomes, e.g. Jetten et al., 2012), optimistic bias and cognitive and behavioural outcomes to such viruses. The current study addressed this by studying the relationships between multiple group membership and optimistic bias on outcomes previously identified as important to individual disease prevention (including affective responses such as disgust), perceived vulnerability to infection, germ avoidance behaviours and infection prevention strategies, including physical distancing.

Counter to our predictions, multiple group membership was not consistently associated with risk enhancing outcomes. Specifically, although multiple group membership was negatively correlated with germ avoidance, it was also positively correlated with protective emotional responses and increased perceived vulnerability - factors linked to avoiding infection. We also observed no relationship between multiple group membership and active controls including physical distancing or perceptions of the severity of the infection to the self.

In line with our predictions, optimistic bias was generally linked to risk related outcomes - negative relationships between optimistic bias and perceived vulnerability, infection prevention strategies (excluding physical distancing) and perceived severity were observed.

Counter to our predictions that the relationship between multiple group membership and outcomes may be mediated by optimistic bias, we observed no evidence of a relationship between multiple group membership and optimistic bias, and no indirect meditational effects.

These findings have a number of practical implications, relevant both to the 2020 COVID-19 pandemic and also future EIDs. The study predicted that being involved with multiple groups may give individuals a false sense of security and optimism. This in turn may reduce the activation of psychological systems and behaviours which may minimise infection risk. The study’s findings suggest this is not the case - multiple group memberships did not have a consistent negative impact on emotional responses or infection control behaviours in the current study. Research in a variety of contexts has shown that groups are beneficial psychological support systems and can build resilience in the face of major life transitions (i.e. Amiot, Terry, & McKimmie, 2012; Ethier & Deaux, 1994; Frings & Albery, 2015; Jones & Jetten, 2011) and one implication from this study is that multiple group memberships should be actively maintained when EID epidemics arise. Specifically, individuals should be encouraged to maintain group memberships and their social capital through different, safe means. This is likely to be especially important in contexts where methods people use to maintain social networks, such as sports events, workplaces, worship sites, schools, and hospitality venues, are made inaccessible.

Although the current findings suggest that support for maintaining group membership may be beneficial, EIDs may make managing multiple group memberships more complicated. For instance, the values and norms that different groups hold can clash, which can interfere with task performance (e.g. Frings, Gleibs, & Ridley, 2019; Jetten et al., 2008), and some research suggests these incompatibilities can become more pronounced, and more problematic, during periods of disaster (Killian, 1952). In particular, EIDs are also characterised by personal blaming of (some) victims for their contraction of a virus and stigmatisation of groups such as victims and front-line care workers/first responders (for instance, in the case of SARs, see Person et al., 2004; Siu, 2008). Instances where group memberships clash on these issues, or an individual becomes a member of a stigmatised group, are likely to be psychologically challenging events, — especially if they lead to rejection from a group (an event which can be psychologically difficult and has similar neurological correlates as physical pain, see Crocker & Major, 1989; Eisenberger, Lieberman, & Williams, 2003). The extent to which groups also foster or inhibit trust in health authorities is also important (Siegrist & Zingg, 2014). Finally, the current research did not account for level of identification with each group (one can be a member of a group but not feel affectively tied to it). This is important as multiple identification seems to be a key factor in health outcomes (see Sani, Madhok, Norbury, Dugard, & Wakefield, 2015). Future research should directly explore these issues in the context of EIDs.

Understanding levels of optimistic bias across a population in the early stages of EID epidemics is important in targeting health communications. The current findings suggest that individuals who feel less likely to be infected than others are also less likely to engage in prevention control behaviours. One implication of this is that health messaging needs to highlight that people are personally vulnerable to infection and, perhaps, also as likely to have a similar prognosis as similar others. However, when considering the relationship between optimistic bias and infection risk, it is also important to note that optimistic bias has positive effects on other areas of our wellbeing — generally, a sense of optimism is good for us in health contexts (Scheier et al., 1989) and can serve as a source of coping resource (Ridder, Schreurs, & Bensing, 2000). Thus, a balance needs to be struck between promoting a general sense of individual optimism, but also reducing unwarranted optimism which leads to risky behaviour. Future research is needed in this area to see how, in the contexts of EIDs, optimistic bias may interact with other factors such as confirmation bias (a focus on information which confirms one’s beliefs and rejection of counterfactuals, Nickerson, 1998), and anchoring (the judgement of a outcome being biased by a set starting point, Jacowitz & Kahneman, 1995) in the understanding of, and response to, risk.

This study has several theoretical implications which must be acknowledged. Counter to our predictions, we observed no relationship between optimistic bias and multiple group membership. This lack of relationship could possibly be explained by those who belong to multiple groups also knowing more ‘similar others’ who have become infected, which may make optimistic bias more difficult to achieve. This remains an open question - but one which may be particularly important when considering distributed health literacy (health knowledge spread amongst a social network, Batterham, Hawkins, Collins, Buchbinder, & Osborne, 2016; Edwards, Wood, Davies, & Edwards, 2015). An interesting possibility is that the effects of groups on optimistic bias varies depending on where they are on the behaviour change path, whether people are considering enacting behaviours or whether they are post-intentional (i.e. have a deliberation vs. implementation mindset, see Keller & Gollwitzer, 2017; Taylor & Gollwitzer, 1995) — optimistic bias seems to be suspended during the planning phase relative to acting. It is possible that the nature of the groups an individual belongs to in terms of social standing, norms and general health beliefs may impact the individual differentially, and that some groups may encourage optimistic bias, while some suppress it. Relatedly, it is possible that multiple group / optimistic bias relationships are culturally bound, as suggested by previous work highlighting mental health benefits of group membership (see Chang, Jetten, Cruwys, Haslam, & Praharso, 2016). While the current sample was insufficient in power to explore this robustly, future research should consider the role of culture as a potential moderator.

In line with the preregistered protocol, the current study collapsed across different descriptions of an epidemic disease, varying in severity, infection type and source. While our findings did not differ when these conditions were controlled for, they added an additional set of error variance to the data. However, we would argue that these reflect the reality of people’s understanding of an EID, which will vary significantly across a population in terms of beliefs and accuracy. The inconsistent findings in the study could be due to the heterogeneity of groups norms around health. It is possible that some group identities foster positive behaviours while others foster risky behaviours, and the relevant strengths of both these groups norms and identity could ameliorate or exacerbate one another (see Miller, Wakefield, & Sani, 2016). This is an area for further research.

The current research also measured relationships between variables cross-sectionally. As such, causation cannot be assumed, especially in relation to behaviours where future intentions were measured. However, the data were collected in a period where such behaviours were likely to be imminently enacted (or not), and thus the discrepancy between intention and actions may well be smaller than in other contexts (Ajzen & Fishbein, 1977).

Finally, the current study measured responses to a fictitious EID, within the context of an actual pandemic. This design has both benefits and drawbacks. A benefit is that it allowed the study to describe the EID without contradicting other (often also self-contradicting) information sources. As discussed above, levels of optimistic bias are also depressed when contemplating a real EID, which would limit the variance within the sample. In contrast, it is also likely that participants’ varying beliefs and understanding of the current COVID-19 pandemic influenced the current results heavily. That said, , it could be argued that it is unlikely this would have affected the pattern of relationships observed and rather, it is possible that the background context lent ecological validity to the study.

In conclusion, the current study highlights the important role of optimistic bias in guiding individuals’ engagement with protective behaviours during EIDs. In contrast to predictions, multiple group memberships, which have been shown to be a psychological buffer to stressful events and life transitions, was not linked to optimistic bias.  
**Data Availability: Data can be found at** [**https://osf.io/43yxv/**](https://osf.io/43yxv/) **along with accompanying pre-registrations and protocols.**

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1. The original Sadique et al., (2007) items were: Avoid public transportation (e.g., trains, buses, airplanes), avoid going out for entertainment (e.g., bars, restaurants, theatres, cinema), limit shopping to the essentials, take leave from work, keep children out of school, even if school remains open (only adults with children were asked this question), limit physical contact with friends and family, avoid seeing doctors, even when sick from something unrelated to flu, stay indoors at all times. [↑](#footnote-ref-2)
2. The description contained a number of manipulations of the description of the virus (in terms of severity, infection vector, source and level of contagion. These manipulations had no significant effects on the outcome variables, with the exception of the severity manipulation, which increased perceived severity. Our sensitivity analysis (see results) accounts for variance associated with these manipulations. [↑](#footnote-ref-3)
3. Given the established links between disgust, risky health behaviour and group identification (Cruwys, Greenaway, et al., 2020), we also conducted an exploratory analysis of a model replacing the overall BIS score with disgust as a single item mediator. The same pattern of results were observed as in the main analysis. [↑](#footnote-ref-4)