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REGULAR ARTICLE

A dual-angle exploration towards understanding lapses in COVID-19 social responsibility

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Abstract

Breaking infection chains requires not just behaviours that allow individuals to stay healthy and uninfected (i.e. health protective behaviours) but also for those who are possibly infected to protect others from their harboured infection risk (i.e. socially responsible behaviours). However, socially responsible behaviours entail costs without clear, immediate benefits to the individual, such that public health-risking lapses occur from time to time. In this important yet understudied area, the current exploratory study sought to identify possible psychological factors that may affect people's likelihood of engaging in socially responsible behaviours. Assuming that self-perceived infection should provide an impetus to engage in socially responsible behaviours, we contend that lapses could occur in two scenarios: discounting of possible infection or prioritizing self-interest over collective good. Through a vignette portraying COVID-19 relevant symptoms presented to culturally diverse participants (Singapore and United States; $N=645$), we found dispositional denialism (an ego defence mechanism) to exert a negative indirect effect on likelihood of engaging in socially responsible behaviours through its negative association with perceived infection status. Further, social value orientation and cultural orientation appeared to significantly moderate the positive association between perceived infection status and the likelihood of engaging in socially responsible behaviours, such that the positive association held only when individuals espouse both a prosocial value orientation and a collectivistic cultural orientation. Further analyses also point toward a possible attenuation of this positive association when individuals espouse a vertical cultural orientation. Future directions and implications for public health management are discussed.

KEY WORDS

COVID-19, cultural differences, denialism, optimistic bias, public health, socially responsible behaviours

While no longer designated as a global health emergency, the devastating impact and lessons to be learnt from COVID-19 remain ever poignant. As of November 2023, close to 7 million lives have been lost to COVID-19 since its emergence (World Health Organization, 2023). Looking back, we propound that a key lesson from this pandemic is the underscoring of social responsibility as a pivotal factor in communicable disease management.

During COVID-19's initial acute phase, people primarily depended on each other's own initiative to engage in socially responsible behaviours (e.g. avoiding social interaction or wearing masks when unwell) while governments deliberated on both the type and scale of public health measures needed to curb the spread (Alon et al., 2020; Bethune & Korinek, 2020; Chater, 2020; Horton, 2020; Nagler et al., 2020). While dependency

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on volitional social responsibility waned as formal public health policies were put in place (e.g. Gwee et al., 2021; Lee et al., 2020; Linka et al., 2020), prolonged compliance with top-down directives eventually bred pandemic fatigue and pressures to ease restrictive measures mounted (Lilleholt et al., 2020; Zerbe, 2020). With COVID-19 now being deemed endemic and most (if not all) restrictive measures lifted despite some evidence that COVID-19 may still pose greater health risks than that of the common cold and flu (e.g. Cook et al., 2022; Iacobucci, 2021; Matsuyama, 2022; Stokel-Walker, 2022), the importance of exercising individual social responsibility (e.g. self-administering rapid antigen test (ART) and masking up when visiting vulnerable individuals) waxes once again.

Notwithstanding, studies have thus far been focusing narrowly on predicting health protective behaviours—behaviours aimed at protecting healthy individuals from the virus, such as washing one's hands frequently or cleaning surfaces that could have come into contact with infectious droplets (e.g. Faasse & Newby, 2020; Maykrantz et al., 2021)—rather than socially responsible behaviours, which are aimed at broadly protecting the community from one's own possible infection risk (e.g. self-isolating when showing relevant symptoms). Communicable disease control entails breaking infection chains, which goes beyond infection prevention behaviours of the healthy and requires those who are possibly infected to also play an active role in curbing disease spread (Shahmanzari et al., 2023).

Accordingly, the current study speaks to prudent calls for greater examination of this understudied but crucially important area (e.g. Low et al., 2022) by setting out to discern psychological factors that may substantively affect people's likelihood of engaging in these socially beneficial behaviours. This is achieved through a critical examination of the relationship between individuals' perceived infection status and their subsequent likelihood of espousing relevant socially responsible behaviours. With the working assumption that heightened perceptions of being possibly infected with COVID-19 should translate into a greater impetus to engage in socially responsible behaviours, such as those observed in studies examining the spread of HIV (e.g. Wolitski et al., 2003), we adopted two different angles in predicting lapses: (a) exploring possible factors that may undermine one's likelihood of perceiving oneself as being possibly infected (which we term as unknowingly lapsing) and (b) exploring possible factors that may directly moderate the positive association between perceived infection status and likelihood of engaging in socially responsible behaviours, such that people's heightened perceptions of being possibly infected do not augment their likelihood of engaging in socially responsible behaviours (which we term as knowingly lapsing).

1 | UNKNOWINGLY LAPSING ON SOCIAL RESPONSIBILITY

When individuals are not sufficiently convinced that they are infected with COVID-19, the failure to engage in socially responsible behaviours (e.g. going to work as per normal) can be characterized as being unintentional—in the sense that they are not willfully exposing others to potential risks because they also discount that they harbour such a risk to begin with. The nature of COVID-19 is arguably conducive for this to happen, given the non-specificity in its symptoms that substantially overlap with other milder causes, such as the common cold or allergies (Hagemann et al., 2021; Jha et al., 2020). Bachtiger et al.'s (2020) study showed that individuals can, in the absence of any medical confirmation, hold various beliefs about their COVID-19 infection status and that such beliefs can affect their willingness to participate in contact tracing. It is thus imperative to discern factors that may affect one's self-appraisal of COVID-19 infection status, such that premeditative efforts could be made to amelioration.

We propose that dispositional denialism could be a critical antecedent factor. Dispositional denialism refers to one's tendency to engage in denialistic thinking (Carver & Scheier, 1994), which involves attaching a negative marker (i.e. affixing 'no' or 'not') to an anxiety-arousing stimulus. Doing so could, cognitively speaking, effectively deny its severity or existence entirely in a bid to render the source of anxiety less threatening to oneself (Cramer, 1999; Paulhus et al., 1997). Denial is one of the six established ego defence mechanisms; other defence mechanisms include compensation, projection, reaction formation, regressive emotionality and repression (Hyphantis et al., 2011).

Denial, in a disease context, occurs when a patient refuses to come to terms with (whether in part or wholly) the fact that he/she/they may be afflicted with a particular disease, which could range from non-lethal diseases such as Alzheimer's disease (Weinstein et al., 1994) to more lethal ones such as cardiac diseases (Levine et al., 1987) and cancer (Kreitler, 1999). A common observation across these prior studies is that denialism tends to discourage treatment-seeking behaviour and encourage non-compliance with medical recommendations. It is thus unsurprising that denialism can serve as a catalyst for disease spread, such as the observed HIV/AIDS spread within South Africa (Buckler, 2008; Fassin & Schneider, 2003; Jaiswal et al., 2020). Based on existing research, we propound that individual differences in denialism could be a key driver of why some individuals show unknowing lapses in COVID-19 social responsibility despite experiencing relevant symptoms, as they could potentially be inclined to attribute their symptoms to less serious causes instead (i.e. affixing a negative marker to the

anxiety-arousing possibility of being infected with COVID-19).

H1. Dispositional denialism would be negatively associated with COVID-19 social responsibility through undermining perceived infection status.

Beyond denialism, we propound that certain individuals may not even perceive COVID-19 to be a substantive threat to themselves. Based on the established Health Belief Model, studies have shown that different individuals possess differing self-assessments of perceived susceptibility to diseases and that those with a greater sense of invulnerability are more likely to disregard medical advice pertaining to lifestyle modifications (Babaei et al., 2020; Champion & Skinner, 2008; Gerend et al., 2004). More specifically, studies suggest that optimistic bias, or self-perceived invulnerability to a disease, is associated with greater health-risking behaviours and attitudes, such as in the context of smoking and sexual intercourse (Greening & Dollinger, 1991; Masiero et al., 2018; Turner, 1994). In the same vein, we propound that those who hold an optimistic bias on COVID-19 may be less willing to deviate from their normal day-to-day behaviours, for they genuinely believe that they are relatively impervious to COVID-19.

H2. Optimistic bias towards COVID-19 would be negatively associated with COVID-19 social responsibility through undermining perceived infection status.

2 | KNOWINGLY LAPSING ON SOCIAL RESPONSIBILITY

Although it is hard to imagine that some people would expose others to the risk of their own harboured communicable disease, such behaviours have been observed for the global spread of HIV/AIDS (Daabo et al., 2012; Lazzarini et al., 2002) and COVID-19 appears to be no exception (Alkhatib, 2021; Forbes, 2020; Seiler et al., 2020). This means that even if people completely acknowledge and accept the possibility that they are infected with COVID-19, it does not necessarily guarantee their engagement in socially responsible behaviours. A key endeavour here then is to identify boundary conditions for the positive association between perceived infection status and social responsibility, such that it is better understood under which conditions would the association be strengthened and under which conditions would the association be weakened, which would thereby better inform relevant public health policies or interventions.

We propose that a key variable might be the relative prioritization of self over collective good. Specifically,

we posit that the association between infection acknowledgement and espousal of social responsibility would be strengthened when one values collective good, such that the motivation to protect other people's well-being outweighs the costs to personal convenience when engaging in socially responsible behaviours (e.g. mask wearing, cancelling social activities). In this light, we examined two pertinent constructs that are indicative of valuing collective good: prosocial social value orientation (SVO) and collectivistic cultural orientation.

Based on the established classification of SVOs, individuals can be classified into one of three categories based on their relative propensity to favour specific outcomes in situations of trade-off: prosocial (cooperators), egoist (individualists) or competitors (Balliet et al., 2009; van Lange, 1999). Prosocial individuals favour outcomes entailing equality and fairness to all parties, egoists prefer maximizing their outcomes regardless of costs to others, and competitors prefer inflicting as much cost onto others as possible (Balliet et al., 2009; van Lange, 1999). Wei et al.'s (2016) experiment demonstrated the unique tendency for prosocial individuals to extend consideration of fairness to others beyond oneself; wherein such participants were observed to select more equitable options despite being offered choices that benefitted themselves more. As such, we postulate that the extent to which infection acknowledgement translates into the espousal of social responsibility will depend on whether one possesses a prosocial SVO, which helps people recognize the importance of promoting collective good beyond narrowly focusing on self-interests.

H3. SVO significantly moderates the positive association between perceived infection status and COVID-19 social responsibility, such that the association holds only for those who espouses a prosocial orientation.

Besides individuals' SVO, we hypothesized a similar moderating role for one's broader cultural orientation. People's cultural orientation is shaped through societal reinforcement of normative values and behaviours within their prevalent cultural milieu, which can affect their relative prioritization of individual distinction versus collective prospering (Triandis, 2001). Cultural orientation has been demonstrated to be relevant to a disease-spread context, with recent studies showing that people holding a collectivistic cultural orientation are more likely to adhere to disease control and prevention measures, such as mask wearing (e.g. Lu et al., 2021). In fact, Chen et al.'s (2021) study suggested that a large amount of variability in compliance with public health measures can be explained by cultural orientation alone, with greater resistance and push-back more consistently being observed in regions with greater individualistic cultural norms. Similarly, Maaravi et al. (2021) examined data collected from 69

different countries and observed that more individualistic participants were less likely to adhere to COVID-19-related measures, which is partly due to their lower willingness to sacrifice for the common good. As such, we hypothesized that the extent to which infection acknowledgement translates into the espousal of social responsibility will similarly depend on whether one possesses a collectivistic cultural orientation.

H4. Cultural orientation significantly moderates the association between perceived infection status and COVID-19 social responsibility, such that the positive association holds only for those who strongly espouse a collectivistic cultural orientation.

3 | METHOD

3.1 | Participants

Past research has demonstrated that there are country differences in the general endorsement of cultural orientation, such that people from Western countries are more likely to espouse individualistic cultural orientation and people from Asian countries are more likely to espouse collectivistic cultural orientation (Forbes et al., 2009; Power et al., 2010), we sought to mitigate a potential issue of underrepresentation for either cultural orientation by sampling participants from two countries—a Western country (United States, US) and an Asian country (Singapore).

Participants were recruited through the online data collection company, Qualtrics Panel. The recruitment targets specified were representative samples of 300 American and 300 Singaporean participants. These sampling targets were set based on resource limits¹. The recruitment, screening and remuneration processes were handled by Qualtrics Panel and participants were paid in accordance with their agreement with the company. The data collection period spanned from late May 2020 to early June 2020.

To buffer for potential low-quality responses, the company oversampled above the target of 600 participants. A total of 645 participants had fully completed the survey. In the sample, 320 participants identified themselves as US Citizens/Permanent Residents (158 male; $M_{\text{age}} = 43.73$, $SD_{\text{age}} = 15.97$). Their ethnicity was generally representative of the US population's ethnic composition (70.9% Caucasian/White, 11.9% African American/Black, 15.3% Hispanic, and 1.9% 'other'). The remaining 325 identified themselves as Singapore Citizens/Permanent Residents (163 male; $M_{\text{age}} = 35.65$, $SD_{\text{age}} = 12.32$). Their ethnicity was also generally representative of the Singapore population's ethnic composition (75.7% Chinese, 13.2% Malay, 9.2% Indian and 1.8% 'other').

3.2 | Procedure

All participants completed the same 15-min survey. They first answered questions about their age, gender, nationality and ethnicity. They then responded to questions relating to disease prevention and immunity, which include their perceived immunity against COVID-19, current engagement in health protective behaviours against COVID-19 and perceived effectiveness of their immune system. Next, measures of dispositional denialism, locus of control, cultural orientation and SVO were administered. An attention check question was presented at this juncture, wherein participants were shown a text blurb followed by an instruction to simply select the fourth option 'other' and type in 'yes' in the textbox (all participants selected the correct option and 99.5% of them duly typed out 'yes'). In the subsequent section, participants read a vignette (described below) and answered corresponding questions assessing their perceived infection status and likelihood of engaging in socially responsible behaviours. Following this, participants responded to questions pertaining to personal evaluations of risk and impact of COVID-19 (e.g. perceived severity of COVID-19 in their community) before being presented with the remaining demographic questions (e.g. highest education, relationship status).

3.3 | Measures

3.3.1 | Vignette

Vignettes are hypothetical scenarios crafted to capture people's intentions, attitudes and intended behaviours (Aguinis & Bradley, 2014). It is a well-established methodology to present situations of high relevance and realism to participants without the associated risks or costs of actual exposure (Hughes & Huby, 2004). The vignette in the current study reads:

COVID-19 is spreading in your community but there are no official movement restrictions and/or controls by your local government. Even though the infection and death counts due to COVID-19 continue to rise and hospitals are slowly being filled up, schools and businesses are still in operation and activities/events are still being held in your community. Mask wearing is encouraged but not mandatory. Your daily routine has largely been uninterrupted. You have been going about your daily life as per normal, albeit with some added precautions as deemed necessary by you. You have been feeling well. One morning, as you wake up, you feel slightly feverish with some mildly stuffy nose and throat irritation. You are otherwise fully functional, with full physical mobility and high concentration level.

Socially responsible behaviours

Participants were tasked to imagine themselves having experienced what was described in the scenario and to indicate, on a scale of 1 (*not likely at all*) to 7 (*extremely likely*), the likelihood that they 'will visit the doctor', 'will go to school/work as per normal' (reverse scored), 'will go out (e.g. to a shopping mall) as per normal' (reverse scored) and 'will wear a mask to protect others whom [they] might encounter in public'. Confirmatory factor analysis (CFA) conducted using MPlus indicated acceptable model fit for a one-factor structure, $\chi^2(2)=34.37$, $p<0.001$, CFI=0.95, RMSEA=0.16, 90% CI=[0.12, 0.21], SRMR=0.05. The scale showed fair internal consistency (Cronbach's $\alpha=0.67$). The four items were averaged to indicate participants' likelihood of engaging in socially responsible behaviours.

Perceived infection status

Through the same vignette, participants were also asked on a scale of 1 (*not likely at all*) to 7 (*extremely likely*) whether they believed that they 'could have possibly been infected with COVID-19' with the symptoms described.

3.3.2 | Dispositional denialism

Dispositional denialism was measured using the 10-item denial subscale of Plutchik et al.'s (1979) Life Style Index (LSI). The LSI is a well-established measure of people's dispositional tendencies towards engaging in the six ego defence mechanisms of compensation, denial, projection, reaction formation, regressive emotionality and repression (Hyphantis et al., 2011). In the measure, participants indicated 'true' or 'false' to statements such as 'my life is so great that a lot of people wish they were in my shoes' and 'I am lucky to have fewer problems than most people'. Number of 'true' responses were then summed for each participant to produce an indicator of their tendency towards engaging in denialism (KR-20 coefficient=0.73).

3.3.3 | Optimistic bias (COVID-19)

The extent to which participants held an optimistic bias against contracting COVID-19 was assessed by having them rate on a scale of 1 (*not susceptible at all*) to 7 (*extremely susceptible*), 'how susceptible do you think you are to be infected with COVID-19?' and 'how susceptible do you think others in general are to be infected with COVID-19?'. A difference score was then computed by subtracting the rating on the former question from that on the latter question. A larger difference score indicates greater optimistic bias.

3.3.4 | Prosocial value orientation

Prosocial value orientation was assessed via the established 9-item Social Values Orientation (SVO) measure (van Lange, 1999). Each item presented participants with three resource allocation options—one maximizes combined payoff for others and self (prosocial), one maximizes payoff for self only (egoist) and one maximizes the difference in payoff between others and self (competitor). As per the scoring instructions, choosing the same allocation type for six or more times would put participants into their corresponding social value orientation category (i.e. prosocial, egoist or competitor). Hence, three indicator variables (one for each value orientation) were created. As per the instructions, participants who received '0' across all three indicator variables were not classified into any value orientation and were classified as 'undetermined'.

3.3.5 | Cultural orientation

Cultural orientation was assessed using the established 16-item Culture Orientation Scale (COS; Triandis & Gelfand, 1998). The COS measures cultural orientation on four dimensions: horizontal individualism (4 items; e.g. 'my personal identity, independent of others, is very important to me'; Cronbach's $\alpha=0.80$), vertical individualism (4 items; e.g. 'when another person does better than I do, I get tense and aroused'; Cronbach's $\alpha=0.75$), horizontal collectivism (4 items; e.g. 'I feel good when I cooperate with others'; Cronbach's $\alpha=0.81$) and vertical collectivism (4 items; 'family members should stick together, no matter what sacrifices are required'; Cronbach's $\alpha=0.86$). Scores within each subscale were averaged to produce four scores, each reflecting one dimension of cultural orientation.

3.3.6 | Covariates

We controlled for several variables to account for their potential confounding effects. For demographics, we accounted for age, gender, education (1=*less than high/secondary school*, 3=*collegel/bachelor's degree*, to 5=*doctoral/professional degree*), household income (1=*\$15,000 or less*, 4=*\$35,001 - \$50,000*, to 8=*\$150,000 or more*), work status, relationship status, religiosity (1=*not at all religious* to 7=*very religious*), and self-reported English proficiency (1=*very poor* to 7=*native speaker ability*). We also accounted for situational and psychological factors that are relevant to the COVID-19 pandemic. These are factors pertaining to evaluations of risk and impact of COVID-19: perceived seriousness of the local COVID-19 outbreak situation (1=*not serious at all* to 7=*very serious*), perceived similarity

between COVID-19 and the common flu (1 = *COVID-19 is no different from the common flu* to 7 = *COVID-19 is completely different from the common flu*), perceived general effectiveness of one's own immune system in protecting one against contagious diseases (1 = *not effective at all* to 7 = *extremely effective*), and whether one's financial situation was impacted either through partial income loss or job loss (*yes/no*).

We also controlled for individual differences in health protective behaviours against COVID-19 and general locus of control. People espousing a greater internal (vs. external) locus of control possess a greater sense of agency and thereby heightened proactivity in taking actions to enact changes or resolve issues (Butterfield, 1964; Lam & Mizerski, 2005; Spector, 1982). These measures, then, respectively provide us with an indicator for participants' baseline tendencies in proactively taking action (versus passive inactivity) against COVID-19 specifically and in a broader context.

For health protective behaviours against COVID-19, participants responded to the question 'how often have you engaged in the following preventive measures in response to the COVID-19 outbreak?' on a scale of 1 (*never*) to 5 (*always*) for a list of nine behaviours: 'wearing a mask when going out', 'consuming vitamin C or any other health supplements to boost immune system', 'avoiding crowded places', 'walking away from people who are sneezing or coughing', 'making and/or amending arrangements to avoid going out', 'ordering takeaway food', 'calling off social gatherings', 'staying at home as much as possible', and 'exercising at home instead of doing outdoor exercise'. CFA conducted using MPlus indicated an acceptable model fit for a one-factor structure, $\chi^2(27) = 167.35$, $p < 0.001$, CFI = 0.89, RMSEA = 0.09, 90% CI = [0.07, 0.10], SRMR = 0.05. The scale showed good internal consistency (Cronbach's $\alpha = 0.73$). Ratings on all items were averaged, with higher values indicating greater engagement levels.

For locus of control, participants completed the 6-item locus of control scale (Hirschman & Almgren, 2016), which was based on Ekstrand et al.'s (1999), Ross and Broh's (2000) and Rotter's (1966) specifications. They rated their agreement on statements such as 'when I make plans, I am almost certain I can make them work' and 'I do not have enough control over the direction my life is taking' (reverse scored) on a 1 (*strongly disagree*) to 4 (*strongly agree*) scale. Higher mean scores indicated greater internal locus of control (Cronbach's $\alpha = 0.65$). Descriptive statistics are summarized in Tables 1 and 2.

4 | RESULTS

A mediation analysis was first conducted using SPSS PROCESS (Model 4; Hayes, 2017) to examine H1. As summarized in Table 3, dispositional denialism was negatively associated with participants' perceived likelihood

TABLE 1 Descriptive statistics of the US sample ($N = 320$).

	<i>M</i>	<i>SD</i>
Demographics		
Age (years)	43.73	15.97
Gender (% male)	49.4%	
Education	3.28	0.89
Household income	5.42	2.18
Work status (% working)	62.5%	
Relationship status (% married)	64.7%	
Religiosity	4.94	1.96
English proficiency	6.48	0.77
Focal variables		
Socially responsible behaviours (Vignette)	5.68	1.18
Perceived infection status (Vignette)	4.80	1.96
Dispositional denialism	6.67	2.34
Optimistic bias towards COVID-19	0.80	1.54
Prosocial value orientation (% categorized as such)	47.2%	
Vertical collectivism	7.19	1.55
Horizontal collectivism	7.18	1.35
Vertical individualism	5.51	1.84
Horizontal individualism	7.34	1.32
Covariates: Action-oriented tendencies		
Health protective behaviours against COVID-19	4.16	0.63
Locus of control	2.89	0.49
Covariates: Evaluations of risks and impact of COVID-19		
Perceived seriousness of local COVID-19 situation	5.42	1.47
Perceived similarity between COVID-19 and flu	5.39	1.63
Perceived general immune system effectiveness	5.24	1.42
Financially impacted by COVID-19 (% yes)	40.0%	

of being infected with COVID-19 in the vignette (perceived infection status), $B = -0.07$, $t(643) = -2.55$, $p = 0.011$, 95% CI = [-0.13, -0.02], whereas the latter was positively associated with the likelihood of engaging in socially responsible behaviours, $B = 0.27$, $t(642) = 11.67$, $p < 0.001$, 95% CI = [0.23, 0.32]. When perceived infection status was added to the model, the effect of dispositional denialism on engagement in socially responsible behaviours became non-significant, thus suggesting a full mediation by perceived infection status. The negative indirect effect was tested using a bootstrap estimation approach with 5000 sample iterations (Shrout & Bolger, 2002), and it was statistically significant, $B = -0.02$, $SE = 0.01$, 95% CI = [-0.04, -0.01].

From the base model above (Model 1), covariates were controlled in a stepwise manner; first accounting for demographics (Model 2), then individual difference variables pertaining to action-oriented tendencies (Model 3),

TABLE 2 Descriptive statistics of the Singapore sample ($N=325$).

	<i>M</i>	<i>SD</i>
Demographics		
Age (years)	35.65	12.32
Gender (% male)	50.2%	
Education	2.78	0.82
Household income	5.14	2.05
Work status (% working)	81.8%	
Relationship status (% married)	45.8%	
Religiosity	4.04	1.93
English proficiency	5.73	0.96
Focal variables		
Socially responsible behaviours (Vignette)	5.79	1.13
Perceived infection status (Vignette)	4.67	1.60
Dispositional denialism	5.94	2.49
Optimistic bias towards COVID-19	0.78	1.19
Prosocial value orientation (% categorized as such)	58.8%	
Vertical collectivism	7.01	1.41
Horizontal collectivism	6.72	1.34
Vertical individualism	5.62	1.41
Horizontal individualism	7.03	1.21
Covariates: Action-oriented tendencies		
Health protective behaviours against COVID-19	4.07	0.55
Locus of control	2.72	0.44
Covariates: Evaluations of risks and impact of COVID-19		
Perceived seriousness of local COVID-19 situation	5.15	1.37
Perceived similarity between COVID-19 and flu	5.10	1.71
Perceived general immune system effectiveness	4.98	1.12
Financially impacted by COVID-19 (% yes)	47.1%	

and finally factors pertaining to evaluations of risk and impact of COVID-19 (Model 4). Therefore, Model 4 effectively contained all measured covariates. All effects reported above remained statistically significant across all four models².

The same analytical steps were repeated to examine H2. As summarized in Table 4, optimistic bias towards COVID-19 was not associated with perceived infection status, $B = -0.06$, $t(643) = -1.08$, $p = 0.280$, 95% CI = [-0.16, 0.05], even though the latter was positively associated with the likelihood of engaging in socially responsible behaviours, $B = 0.27$, $t(642) = 11.86$, $p < 0.001$, 95% CI = [0.23, 0.32]. Testing for an indirect effect using the bootstrap estimation approach with 5000 sample iterations showed a non-significant effect, $B = -0.02$, $SE = 0.02$, 95%

TABLE 3 The relationship between dispositional denialism and likelihood of engaging in socially responsible behaviours as mediated by perceived infection status.

Model	<i>B</i>	<i>SE (B)</i>	<i>t</i>	<i>p</i>	<i>R</i> ²
Outcome: Perceived infection status					
Dispositional denialism*	-0.07	0.03	-2.55	0.011	0.01
Outcome: Socially responsible behaviours					
Dispositional denialism	0.004	0.02	0.24	0.811	0.18
Perceived infection status*	0.27	0.02	11.67	<0.001	

* $p < 0.05$.

TABLE 4 The relationship between optimistic bias towards COVID-19 and likelihood of engaging in socially responsible behaviours as mediated by perceived infection status.

Model	<i>B</i>	<i>SE (B)</i>	<i>t</i>	<i>p</i>	<i>R</i> ²
Outcome: Perceived infection status					
Optimistic bias towards COVID-19	-0.06	0.05	-1.08	0.280	0.002
Outcome: Socially responsible behaviours					
Optimistic bias towards COVID-19*	0.08	0.03	2.49	0.013	0.18
Perceived infection status*	0.27	0.02	11.86	<0.001	

* $p < 0.05$.

CI = [-0.05, 0.02]. These results remained consistent after the stepwise control of the covariate variables².

To test H3, a moderation analysis was conducted using SPSS PROCESS (Model 1; Hayes, 2017), with the interaction term mean centred. It was observed that the association between perceived infection status and the likelihood of engaging in socially responsible behaviours was not moderated by prosocial value orientation (interaction term: $B = 0.03$, $t(641) = 0.61$, 95% CI = [-0.06, 0.12], $p = 0.545$). This result remained consistent after the stepwise control of the covariate variables, as well as when the other two value orientations (egoist and competitor) were also controlled for².

These same analytical steps were repeated to examine H4. Results showed that the association between perceived infection status and likelihood of engaging in socially responsible behaviours was significantly moderated by vertical collectivism, $B = -0.03$, $t(641) = -2.11$, 95% CI = [-0.06, -0.002], $p = 0.035$, but not horizontal collectivism, $B = -0.02$, $t(641) = -1.56$, 95% CI = [-0.05, 0.01], $p = 0.118$. Simple slopes analysis revealed an attenuation of the relationship between perceived infection status and likelihood of engaging in socially responsible behaviours at higher levels of vertical collectivism (see Figure 1), though the association remained statistically significant across all levels of vertical collectivism. However, when covariate variables were controlled in a

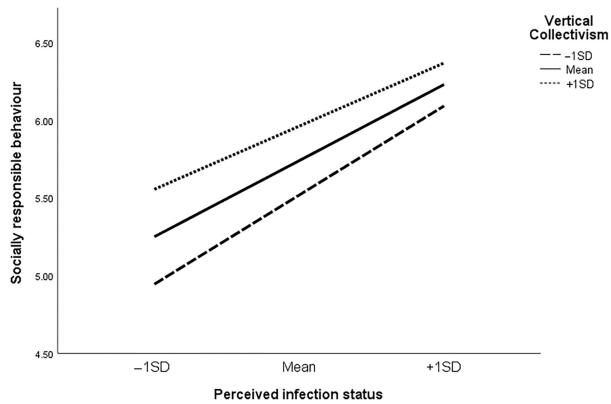


FIGURE 1 Simple slopes (unstandardized coefficients) of perceived infection status predicting socially responsible behaviours with vertical collectivism at 1 SD above and below the mean.

stepwise manner (i.e. from Model 2 onwards), the result became non-significant².

4.1 | Post hoc supplementary analyses

To ascertain if prosocial value orientation may have had its moderating effect masked by cultural differences within our culturally heterogeneous sample, a three-way interaction effect between perceived infection status, prosocial value orientation and cultural orientation was probed using SPSS PROCESS (Model 3; Hayes, 2017). A statistically significant three-way interaction was found for the specific cultural orientations of vertical collectivism, $B=0.07$, $t(637)=2.17$, $p=0.031$, 95% CI=[0.01, 0.13], and horizontal collectivism, $B=0.08$, $t(637)=2.48$, $p=0.013$, 95% CI=[0.02, 0.14], but not for vertical or horizontal individualism. Probing these results further using simple slope analyses revealed a significant two-way interaction effect between perceived infection status and prosocial value orientation, which only held when either vertical, $F(1, 637)=4.34$, $p=0.038$, or horizontal collectivism, $F(1, 637)=4.44$, $p=0.036$, was at higher levels (+1 SD), but not at mean or lower levels (-1 SD). At high levels of either vertical or horizontal collectivism, possessing a prosocial value orientation (vs not) was observed to augment the association between perceived infection status and socially responsible behaviour. These results held broadly throughout the stepwise controlling of measured covariates³.

Finally, analyses relevant to H4 were expanded to examine the remaining two non-hypothesized dimensions of cultural orientation—vertical and horizontal individualism. Results showed that the association between perceived infection status and socially responsible behaviour was significantly moderated only by vertical individualism, $B=-0.04$, $t(641)=-3.37$, 95% CI=[-0.07, -0.02], $p=0.001$, and not horizontal individualism, $B=-0.01$, $t(641)=-0.45$, 95% CI=[-0.04, 0.03], $p=0.653$. Simple slopes analysis revealed an attenuation of relationship

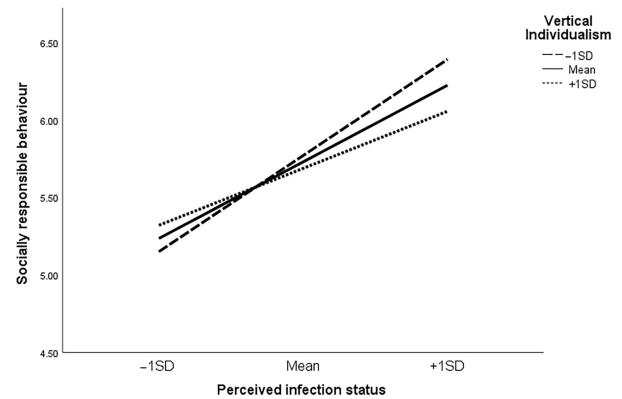


FIGURE 2 Simple slopes (unstandardized coefficients) of perceived infection status predicting socially responsible behaviours with vertical individualism at 1 SD above and below the mean.

strength between perceived infection status and socially responsible behaviour as vertical individualism levels increased, as illustrated in Figure 2, though the association remained statistically significant across all tested levels of vertical individualism. All results held through the stepwise controlling of measured covariates².

5 | DISCUSSION

Based on a relatively large sample ($N=645$) of culturally diverse participants, we uncovered important mechanisms that elucidate two forms of lapses in COVID-19 social responsibility. First, we reasoned that some individuals may hold a genuine belief that they are not infected with the virus and are therefore risking others to contracting COVID-19 only unintentionally. Based on research in the context of disease spread and other relevant health behaviours (e.g. Buckler, 2008; Masiero et al., 2018), we posited that people's general predisposition to engaging in denialism (dispositional denialism; H1) and their level of self-perceived invulnerability to catching the disease (optimistic bias; H2) may be crucial drivers of such unknowing lapses.

Our results supported H1. Specifically, we found dispositional denialism to be negatively associated with one's likelihood to engage in socially responsible behaviours through reduced tendency of appraising oneself as being infected with COVID-19 despite presenting relevant symptoms. Notably, this was found to be a complete mediation effect—meaning that individuals' perceived infection status fully explains the relationship between dispositional denialism and COVID-19 social responsibility.

However, the current results did not support H2 regarding the role of optimistic bias in engaging in socially responsible behaviours (i.e. H2 unsupported). This finding appears to run contrary to the established Health Belief Model, which did receive mixed empirical results in the context of COVID-19 in prior research, with some

studies showing optimistic bias to predict compliance with preventive measures (e.g. Stangier et al., 2021) and others finding it to be a non-significant predictor (e.g. Clark et al., 2020; Levkovich & Shinan-Altman, 2021). Our finding, though specific only to the context of socially responsible behaviours, appears to be more consistent with the latter.

Taken together, these findings suggest that a prime predictor of individuals discounting the likelihood of being infected with COVID-19, and consequently, their decreased likelihood of engaging in socially responsible behaviour is their predisposition towards mentally denying that relevant symptoms are attributable to severe, anxiety-inducing causes (i.e. COVID-19) rather than their perceived invulnerability towards COVID-19. Hence, to mitigate unknowing lapses in COVID-19 social responsibility, efforts could be better funnelled towards interventions that facilitate more constructive management of individuals' anxiety over contracting the disease (e.g. assurance of available medical care) rather than propagating susceptibility-related information (e.g. accentuating infection numbers, highlighting risk factors and vulnerabilities, etc.).

For those who are sufficiently convinced that they may be infected with COVID-19, we proposed that the likelihood of whether they would engage in socially responsible behaviours would depend on whether they possessed a prosocial SVO (as opposed to the other SVOs; H3) and the extent to which they espoused a collectivistic cultural orientation (H4).

Our results, however, did not support H3. Instead, post hoc analyses suggested a possible three-way interaction effect, such that whether one holds a prosocial value orientation or not would moderate the association between perceived infection status and COVID-19 social responsibility when one also possesses a collectivistic cultural orientation (regardless of the vertical or horizontal facet). In other words, the findings suggest that people could be more likely to engage in socially responsible behaviours under the perception that they might be infected with COVID-19 only when they endorse both a prosocial value orientation and a collectivistic cultural orientation. This preliminarily suggests that promoting prosociality among individuals to encourage COVID-19 social responsibility may only be effective within a pre-existing collectivistic cultural backdrop, but replication and validation are necessary before any firm conclusions can be drawn.

Regarding cultural orientation on its own, unexpectedly, we found that only the specific dimension of vertical collectivistic cultural orientation moderated the association between perceived infection status and COVID-19 social responsibility—horizontal collectivistic orientation, on the other hand, was not found to be a statistically significant moderator. Also, the effects were contrary to what we hypothesized in H4—suggesting a weakening rather than a strengthening of association between perceived infection status and COVID-19 social

responsibility when one possesses higher levels of vertical collectivistic orientation. Probing further via post hoc analyses, we observed a similar pattern of findings when considering vertical and horizontal individualistic orientation levels. Specifically, vertical (but not horizontal) individualistic orientation significantly moderated the association between perceived infection status and COVID-19 social responsibility, such that the association is weakened with higher levels of vertical individualistic orientation.

Taken together, the findings above suggest that the moderating effect of cultural orientation may lie within the vertical-horizontal dimension rather than the individualistic-collectivistic dimension, such that the likelihood of engaging in socially responsible behaviours when perceived to be possibly infected with COVID-19 could potentially be attenuated as one endorses a vertical cultural orientation more, regardless of whether it is of an individualistic or collectivistic nature. The key distinction of the vertical-horizontal dimension lies in the emphasis on hierarchy, such that those espousing a vertical cultural orientation endorse hierarchical or power differences among people and those espousing a horizontal cultural orientation endorse equality (Arpaci, 2019; Shavitt & Cho, 2016). Thus, a plausible explanation for these findings is that those who emphasize a hierarchical social structure or power differences may have felt that the onus of disease prevention and protection of public health lies squarely upon higher authorities, such as the government or relevant health organizations, rather than on their own selves.

At face value, these findings suggest that broadly fostering a culture of collectivism may not be as effective in encouraging COVID-19 social responsibility as findings of past studies have suggested (e.g. Chen et al., 2021; Maaravi et al., 2021)—at least in context of preventing one from knowingly lapsing on COVID-19 social responsibility. Rather than encouraging prioritization of collective good, efforts may be better aimed at reducing power distance and emphasizing shared responsibility among all individuals of a society. However, it should be noted that even though the moderating role of vertical individualism withstood our stepwise controlling of covariates, vertical collectivism did not. This appears to be somewhat consistent with Xiao's (2021) findings, which suggest a possible positive utility for vertical collectivism in the context of compliance with COVID-19 measures while vertical individualism was found to be detrimental. Nonetheless, further studies are needed to clarify and validate these findings before firmer conclusions can be drawn.

5.1 | Limitations and future directions

Although the current study employed a relatively large and culturally diverse sample and accounted for many

relevant covariates, certain limitations exist. First and foremost, the present study recruited participants from just two countries. Furthermore, while Singapore has traditionally been considered to be more collectivistic (Chen et al., 2021; Lau, 1992; Tan, 2008), some have suggested that its endorsement of collectivism may be waning (Mu & Hu, 2018) and our observed mean COS values do point toward such a possibility. Hence, future studies should sample other countries to replicate and validate our findings.

The cross-sectional and correlational design of our study also necessitates caution with causal inferences. Furthermore, given the dynamicity of the COVID-19 pandemic, it may be worthwhile for future studies to examine our observed relationships using a longitudinal design. For instance, it may be beneficial to ascertain if these relationships would change depending on the state of legally enforced COVID-19 measures. Where ethically and logistically permissible, in light of our findings, researchers may also consider conducting a full experimental or quasi-experimental study involving volunteer participants who are actually presenting symptoms of the disease and measure actual rather than intended socially responsible behaviours. Such efforts would provide corroboration to our findings obtained through vignettes, which are limited to capturing intended rather than actual behaviour.

Future studies could also build upon our study to examine if our identified factors would also predict one's receptiveness towards receiving COVID-19 vaccines and whether one would dutifully swab themselves using Antigen Rapid Test (ART) kits before visiting others as additional forms of COVID-19 social responsibility—both of which did not exist during our data collection period. Finally, given the current ubiquity of confirmatory COVID-19 testing, it might be useful for further studies to examine the impact of knowing one's actual infection status on the likelihood of engaging in socially responsible behaviours.

6 | CONCLUSION

Approaching the issue of COVID-19 social responsibility from two angles, our study illuminated key factors and mechanisms that may hamper individuals' likelihood of engaging in socially responsible behaviours. We found evidence suggesting that dispositional denialism, but not optimistic bias towards COVID-19, can lead one to unknowingly lapse on COVID-19 social responsibility through substantively reducing one's likelihood to appraise oneself as being infected, despite presenting relevant symptoms. Our results also point towards a possible role of cultural orientation and a potential interactive effect with SVO in affecting whether individuals who sufficiently believe they could be infected would then proceed to knowingly lapse on COVID-19 social responsibility.

As an understudied area, our study presents one of the first forays into empirically uncovering such nuanced mechanisms of COVID-19 social responsibility, which we believe would be useful for the formulation of public health interventions and policies that would better protect us in current and future pandemics.

AUTHOR CONTRIBUTIONS

Sean T. H. Lee: Conceptualization; data curation; formal analysis; investigation; methodology; project administration; resources; supervision; writing – original draft; writing – review and editing. **Jerome J. X. Mah:** Resources; validation; writing – original draft; writing – review and editing. **Angela K.-y. Leung:** Conceptualization; investigation; methodology; project administration; resources; supervision; validation; writing – review and editing.

CONFLICT OF INTEREST STATEMENT

The author declares that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

DATA AVAILABILITY STATEMENT

Data available on request from the authors.

ETHICS STATEMENT

IRB approval was obtained prior to the commencement of this study and all participants provided their informed consent at the beginning of the online survey.

RESEARCH MATERIALS AVAILABILITY STATEMENT

Materials available on request from the authors.

PRE-REGISTRATION STATEMENT

An early proposal was submitted on the 16th of March 2020 to the Psychological Science Accelerator (PSA) for multilab data collection (<https://psysciacc.org/2020/03/13/the-psa-calls-for-rapid-and-impactful-study-proposals-on-covid-19/>) but was unsuccessful. This proposal document alongside an archival pdf document of the call itself can be found at <https://osf.io/4c2ej/>.

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ENDNOTES

¹ An early proposal was submitted on 16 March 2020 to the Psychological Science Accelerator (PSA) for multilab data collection (<https://psysciacc.org/2020/03/13/the-psa-calls-for-rapid-and-impactful-study-proposals-on-covid-19/>) but was unsuccessful. This proposal document alongside an archival pdf document of the call itself can be found at <https://osf.io/4c2ej/>.

² Additionally accounting for nationality (0 = US, 1 = Singapore) as a covariate did not result in substantive changes to the results.

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