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Social axioms and psychological toll: A study of emotional, behavioral, and cognitive responses across 35 cultures during the COVID-19 pandemic

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Abstract

The COVID-19 pandemic has significantly affected the psychological well-being of individuals worldwide. Previous research has indicated that values and beliefs, particularly social axioms, are associated with psychological responses during crises. However, most of the studies have focused on specific regions; the impact of social axioms on a global scale remains unclear. We conducted a multinational study comprising stratified samples of 18,171 participants from 35 cultures. Using multilevel modeling, we examined the associations between social axioms, personal worry, normative concerns, trust, and individuals' psychological responses to the pandemic. The results showed that greater personal worry and normative concerns predicted more negative psychological responses. Furthermore, the study also identified significant buffering effects at the societal level, as cultures with higher overall levels of fate control, religiosity, or reward for application exhibited weaker associations between personal worry and negative responses. Our findings reveal the influence of

social axioms on psychological responses during the pandemic, with varying effects across cultures. The buffering effects of fate control, religiosity, and reward for application underscore the importance of considering cultural differences and individual variability when examining the impact of social axioms on psychological outcomes.

KEYWORDS

COVID-19, psychological responses, social axioms, trust, well-being

INTRODUCTION

In the unprecedented era of the COVID-19 pandemic, it has become increasingly evident that an individual's values and beliefs play a pivotal role in shaping their responses to this global health crisis. The present research seeks to elucidate the intricate relationship between these foundational worldviews and their associations with public health behaviors, decision-making processes, and adherence to preventive measures during this critical period of adversity (Chen et al., 2021; Pennycook et al., 2020; Tong et al., 2020). By tapping into the multidimensional social axioms using data collected from over 18,000 adults nested within 35 cultures, this study aims to provide valuable insights and foster a deeper understanding of the mechanisms underlying societal resilience and collective actions in the face of the COVID-19 pandemic.

Social axioms

Social axioms serve as an essential complement to values in comprehending cultures and accounting for cross-cultural differences (Leung et al., 2002; Leung et al., 2012). Defined as generalized expectancies or general social beliefs, social axioms function as fundamental premises guiding human behavior (Leung et al., 2002). These axiomatic beliefs encompass convictions about individuals, social institutions, the physical or spiritual realm, and various social phenomena.

Five distinct dimensions of social axioms were identified as measured by the Social Axioms Survey (SAS; Leung et al., 2002). *Social cynicism*, for instance, embodies a rather pessimistic outlook on society, often coupled with a biased perspective towards certain social groups. *Social complexity*, on the other hand, entails the belief that there exist multiple avenues to solve a given problem and that people adapt their behavior according to varying circumstances and situations. *Reward for application*, yet another dimension, is characterized by a faith in the principle that diligent planning and hard work can yield positive outcomes. *Religiosity*, the fourth dimension, pertains to the belief in the existence of supernatural entities, and the conviction that traditional religiousness has a beneficial impact on society. Finally, the fifth dimension, *fate control*, encompasses the notion that fate exerts influence over life outcomes, but that it can be predicted and even changed.

Social axioms have been empirically tested and validated through multiple studies, and its measurement invariance of the five-factor model has also been established across diverse cultural groups, providing further validation of the construct (Bou Malham & Saucier, 2014; Cheung et al., 2006). These axioms have been found to relate to a variety of psychological constructs and influence behaviors, and its validity has been demonstrated through associations with well-established measures (e.g., interpersonal trust, cognitive flexibility, and locus of control; Singelis et al., 2003) and multitrait-multimethod assessment across cultures (e.g., self-efficacy, self-construals, and trait modesty; Chen et al., 2017). Furthermore, various aspects of psychological outcomes were associated with social axioms in previous research. For example, longitudinal studies found that social cynicism negatively predicted job satisfaction among people with low levels of perceived well-being (Leung et al., 2010); Yang et al. (2021) found that social cynicism, but not the other four dimensions, was significantly associated with Internet gaming disorder tendency among university students; additionally, social cynicism exhibited a strong positive correlation with ageist attitudes in a Portuguese sample (Neto, 2006). A study among Iranian people revealed a positive association between reward for application and active coping strategies for managing life stressors (Safdar et al., 2006). Religiosity and social complexity have been found to positively correlate with praying and conversational comfort with strangers, respectively (Singelis et al., 2003). Religiosity beliefs have also been associated with intergroup attitudes, such as the endorsement of unwelcoming acculturation orientations towards culturally distant immigrants (Safdar et al., 2008). Therefore, social axioms have demonstrated substantial validity and broad applicability through their associations with various psychological constructs and impacts on a variety of behavioral outcomes.

Drawing upon existing research, it is evident that the diverse impacts of social axioms can extend to individuals' psychological response to crisis situations, such as the COVID-19 pandemic. Prior research has extensively explored the impact of social axioms on individual well-being and functioning across various cultures (Chen et al., 2016), particularly highlighting the roles of two dimensions of social axioms: social cynicism and reward for application. For example, social cynicism tends to negatively correlate with well-being, as it is associated with less adaptive self-regulation and lower subjective well-being (Hui & Bond, 2010), and negatively affects students' perceived control over academic performance (David & Bernardo, 2021). In contrast, reward for application is positively linked to well-being, promoting adaptive self-regulation and enhancing perceived academic control. Social axioms also have crucial practical implications, such as their influence on suicidal ideation, as seen in studies among Hong Kong Chinese (Chen et al., 2009) and American college students (Dangel et al., 2018). Longitudinal studies further demonstrate that high levels of social cynicism correspond to reduced life satisfaction, while low social cynicism and high reward for application are associated with increased life satisfaction (Lai et al., 2007; Li et al., 2020; Mak et al., 2011).

However, some findings present nuances that are different from existing assumptions, which leaves some gaps for further research. For instance, one study observed that religiosity did not correlate with life satisfaction, even in a sample where religion was considered highly important; in contrast, social cynicism and reward for application remained as salient predictors of life satisfaction (Mak et al., 2011). Contradicting previous literature, other research has illuminated the adverse aspects of fate control, revealing that beliefs in fate control were significant influencers of problematic gambling behaviors among gamblers (Hu et al., 2018; Tang & Wu, 2010). These findings contribute to an extensive body of work that has examined the multifaceted impacts of social axioms on individual well-being, thereby underscoring the differences of social axioms' influences across diverse cultural settings. These distinct dynamics warrant

further investigation, particularly within the context of the ongoing COVID-19 crisis. Undoubtedly, in previous investigations, social cynicism and reward for application have emerged as two prominent dimensions in the exploration of social axioms and psychological well-being. In the present study, we aim to build on prior works by further investigating the relationships between each axiom dimension and psychological responses in order to deepen our understanding of the specific role played by individual social axioms.

At the societal level, social axioms represent widely shared assumptions about the nature of the world and society that are held by members of a broad cultural group or nation (Bond, Leung, Au, Tong, de Carrasquel, et al., 2004; Leung & Bond, 2008). These are considered to be distinct from, though related to, individual differences in the endorsement of social axioms (Bond, Leung, Au, Tong, de Carrasquel, et al., 2004). For example, "societal cynicism" is a term coined to refer to cynicism manifesting at a cultural or societal level, which exists as a property of cultures and societies, reflecting shared assumptions, norms, values, and behavioral tendencies towards pessimism, wariness, and selfishness and is associated with cross-cultural variation in corruption, governance styles, social capital, and other societal patterns (Bond, Leung, Au, Tong, de Carrasquel, et al., 2004). As social cynicism has consistently demonstrated negative associations with trust in previous research (e.g., Kurman, 2011; Singelis et al., 2003), it follows that a society high in cynicism would exhibit lower trust, less collaborative behaviors, and stronger psychological responses during crises. Therefore, this demographic, political, economic, and psychological profile at varying levels of societal cynicism could serve as a cultural framework to examine how different societies psychologically responded in distinct ways across the stages of the pandemic. For example, communities with high societal cynicism may show a lack of adherence to social norms, intensified reactions, and heightened worries during COVID-19. The other four dimensions of societal axioms (termed "dynamic externality"), as identified by Bond, Leung, Au, Tong, de Carrasquel, et al. (2004), also formed dynamic cultural profiles of educational, social, and political development, including life expectancy, literacy rates, gender equality, human rights, and health/education spending. These axioms reflect cultural differences in the normative belief that life events may be influenced by external or spiritual forces beyond one's personal control, such as fate, a higher power, or efforts tied to rewards. In this study, we expect societies with a strong norm of dynamic externality may reinforce a perception of reduced personal agency and responsibility, decoupling individual-level worries about the pandemic from the societal belief. As previous research has indicated, societal-level social axioms may construct social norms that either facilitate or suppress the individual-level impact of social axioms (Bernardo et al., 2021). For instance, a strong societal norm of attributing efforts to positive results may facilitate the perception that collective actions are important. Therefore, seeing authorities implement preventive procedures could attenuate the impact of individual-level panic and worries. Thus, societies with varying levels of social axioms may exhibit different pandemic response patterns. Examining variation in these societal axioms can reveal how emotion, cognition, and behavioral efficacy shape perceived capability to enact change across pandemic stages and why policies and impacts diverged greatly between countries and cultures. In this study, in addition to examining social axioms at the individual level, we aimed to analyze whether societal-level variations moderate the associations between predictors and psychological responses.

Social axioms and psychological responses

In a crisis like the COVID-19 pandemic, individuals' reactions and coping mechanisms can be influenced by their general beliefs or perceptions about their social world. Social axioms, for

example, can potentially shape individuals' understanding of the situation, emotional responses, and even strategies for dealing with the crisis.

Individuals high in social cynicism tend to hold more negative, pessimistic views of human nature and society in general. When the COVID pandemic hit, activation of these cynical assumptions may have shaped cognitive appraisals and interpretations of pandemic events in a more negative light. For example, cynical individuals may have been quicker to appraise information or policies from authorities with suspicion or distrust, assuming selfish motivations. They may have interpreted rising case numbers as signs of incompetence or human failing more readily. As one study found, individuals with high social cynicism demonstrated low locus of hope (Bernardo & Nalipay, 2016). These cynical cognitive appraisals in turn could trigger more frequent and intense feelings of anger, anxiety, depression, or hopelessness in response to pandemic news, as typically seen in public crises (Yeung & Fung, 2007) and tragic life events (Xiu et al., 2016). Furthermore, a cynical worldview undermines the belief that collective cooperation can overcome challenges, thereby diminishing perceptions of self- and collective-efficacy that are crucial for resilience and collective efforts, such as maintaining personal hygiene (Tong et al., 2020) or fostering international collaboration (Chen et al., 2012). With lower perceived efficacy, social cynics are likely to experience more stress, uncertainty, and negative emotion coping with lockdowns, public health measures, and work/lifestyle disruption (Leung et al., 2010). In these ways, social cynicism as an orientation can cognitively and emotionally predispose people to heightened psychological distress during global crises by shaping negative appraisals and eroding perceived capability to enact change.

Individuals with high social complexity tend to see the world in more nuanced, non-binary terms. This cognitive style is likely to promote more balanced appraisals of the complex, rapidly evolving pandemic situation. With more openness to contradiction and flexibility in response options, socially complex individuals may have experienced less polarization about ambiguous elements of the crisis, such as the origin of the virus, efficacy of public health measures, and economic restrictions. Less polarized judgments could attenuate negative emotional reactions to pandemic developments. As a recent study pointed out, social complexity facilitates dialectical thinking, in turn contributing to more flexible coping strategies in daily life (Ng & Chen, 2022).

Individuals with high fate control beliefs tend to view life events as predestined and inevitable rather than within their own control. When applied to the pandemic, rather than appraising public health measures, individual precautions, or social support as means to control risks, those high in fate control may have seen infection and hardship from lockdowns as unavoidable. Such a pessimistic view and a lack of perceived behavioral efficacy can undermine resilience, heightening helplessness, anxiety, and despair and promote passive coping (Wu et al., 2020). This passive response pattern may eventually contribute to distress and poor wellbeing during adversity.

Reward for application and religiosity are two social axiom dimensions that may act as protective factors that help inoculate people from some of the psychological harm during global crises. Individuals who believe strongly in reward for application tend to emphasize effort, planning, and resource investment and may have readily followed public health guidelines or keep a good personal hygiene during lockdowns (Tong et al., 2020). Being able to enact constructive behaviors buffers the helplessness and despair that erode wellbeing during crises and perhaps also reinforces engagement in other healthy practices or reduces problematic behaviors (Zhang et al., 2021). Religiosity, during the pandemic, may have provided a sense of meaning or reassurance amid profound uncertaint, and promoted acceptance and courage in enduring

hardship. Additionally, religiosity could provide access to congregation-based social support, and being integrated into a support network sustains people through suffering. As previous research reported, beliefs in religiosity and reward for application were found to predict stronger posttraumatic growth in disaster survivors (Nalipay et al., 2017). In addition, religiosity demonstrated a negative association with prolonged grief symptoms (Xiu et al., 2016). Thus, these social axiom dimensions may act as protective factors that help inoculate people from some of the psychological harm that communal crises can inflict.

Building upon the aforementioned work, some recent studies have explored the potential impact of social axioms during the COVID-19 pandemic. In surveys of over 600 Chinese adults, Tong et al. (2020) found social cynicism related to lower hygiene compliance, while reward for application associated with greater compliance to safety measures. Additionally, Zhang et al. (2021) showed social cynicism was associated with more problematic smartphone use potentially due to lower trust in authorities, whereas reward for application was related to more disciplined usage. Another study revealed that those higher in fate control favored donating to in-group COVID-19 patients and workers, had higher risk perceptions, and donated more to in-groups (Li et al., 2021). These findings underscore how social axioms may serve as risk or protective factors during challenging situations like a pandemic.

In summary, social axioms are deep-seated and stable beliefs about the world, and they can significantly shape individuals' psychological responses to the pandemic. To comprehensively examine the impact of social axioms during the pandemic, we investigate the psychological responses amid the COVID-19 pandemic through the lens of the tricomponent attitude model (Gilbert et al., 1998). This model is predicated on three essential components involved in the psychological process: affect, cognition, and behavior. Measures corresponding to each of these three components (i.e., emotional responses, behavioral responses, and perceived protection efficacy) were employed.

Personal worries and normative concerns

Personal worries and normative concerns regarding the pandemic refer to the worries that the pandemic outbreak would affect the individual and people around them. In periods of global public health crises, understanding common factors like personal worry and normative concerns become paramount as they serve as vital predictors for individuals' psychological responses. Existing literature has highlighted this relationship in various crisis situations. Worries and concerns about one's health, financial security, or the well-being of loved ones can influence emotional responses during the crisis (Manchia et al., 2022). High levels of worries are likely to be associated with increased anxiety, stress, and possibly depressive symptoms (Choi et al., 2020; Ryu & Fan, 2023). Such impact can also expand to behaviors. Individuals with high levels of personal worries and normative concerns might be more likely to engage in protective behaviors or even lead to maladaptive behaviors. For example, during the H1N1 influenza pandemic, heightened worry was linked to preventive actions such as stockpiling essential supplies, avoiding public transportation, and maintaining heightened focus on daily tasks (Goodwin et al., 2011). In fact, an increase in worry about COVID-19 has been shown to catalyze the adoption of protective measures, accentuating the critical role of these psychological factors in shaping individual responses to disease outbreaks (Smith et al., 2022). Besides, less worried individuals who were more confident and knowledgeable tend to report higher self-protection efficacy (Avery & Park, 2021), suggesting that the cognitive processes were associated

with worries and concerns as well. This accumulating body of evidence suggests that understanding the nuances of worry and concern, as well as their direct emotional, behavioral, and cognitive implications, is imperative for effectively navigating public health crises.

The role of trust

Recent research highlights the critical role of trust in shaping psychological responses during the COVID-19 pandemic. Trust, a crucial element of social capital, facilitates overcoming potential cooperation challenges in societies (Kye & Hwang, 2020). It also maintains associations with individuals' well-being (Jen et al., 2010). In global crises impacting groups and societies, trust plays a significant role in influencing pandemic outcomes and psychological responses (Siegrist & Zingg, 2014). Therefore, the importance of trust during a pandemic cannot be overstated, as it not only fosters collaboration and resilience among societies but also influences individuals' adherence to health guidelines and acceptance of vaccines, as well as psychological responses to a pandemic. A number of recent studies have underscored the importance of trust in predicting people's reactions to COVID-19. For example, surveys across 23 countries found that trust in government positively associated with people's willingness to adhere to recommended behaviors (Han et al., 2023). Similarly, experiments found that institutional trust and interpersonal trust led to adherence to prevention norms and behaviors (Yuan et al., 2022). Studies conducted by Ebrahimi et al. (2021), Troiano and Nardi (2021), and Chen et al. (2023) have also found that vaccine hesitancy during the COVID-19 pandemic was significantly influenced by various factors, with a general lack of trust being a prominent reason. The impact of trust also varies across different societies. Studies conducted across cultures found that there is a positive correlation between a country's level of trust and its resilience against the pandemic, with countries that surpass certain trust thresholds even able to achieve a near-complete reduction in new cases and deaths (Lenton et al., 2022). In fact, societies with tighter social norms showed greater trust in government officials and viewed preventive measures like mask-wearing as civic duties rather than personal freedom infringements (Kemmelmeier & Jami, 2021). These studies highlight the pivotal role of trust in managing public health crises.

On the other hand, as fundamental beliefs about the world and human interactions, social axioms significantly influence how individuals perceive and trust others. So far, some research has found associations between social axioms and trust. For example, individuals with high levels of social cynicism are likely to have a general distrust of others (Kurman, 2011; Singelis et al., 2003). This worldview can lead to skepticism and a lack of trust in both interpersonal relationships and institutional systems, as mutual trust is essential for successful collaborations (Bond, Leung, Au, Tong, & Chemonges-Nielson, 2004). As a result, social cynicism associated with mistrust in authorities may lead to problematic coping behaviors during the pandemic (Zhang et al., 2021). In addition, people who score high on social complexity sometimes demonstrated lower interpersonal trust (Singelis et al., 2003). As the pandemic evolves, the rapid changes in scientific discoveries and government responses may align with the belief that people's actions, and intentions are not consistent across situations, leading to uncertainty and hesitance to trust. Therefore, in this study, we aimed to control for the factor of trust in order to isolate and examine the unique predictive power of social axioms on psychological responses to the pandemic. Specifically, individuals' general trust towards others and their trust in institutions (including trust in local healthcare facilities, local healthcare services, healthcare professionals, and scientists or researchers) were examined as covariates in the current study.

The present study

Existing research aforementioned has illuminated the potential impact of social axioms on individuals' psychological responses, adherence to preventive measures, and decision-making during the COVID-19 pandemic, primarily through regional studies. Recognizing the need to broaden our understanding of these dynamics on a global scale, our study encompassed a sample of community adults across 35 cultures, with a particular emphasis on people's affective, behavioral, and cognitive responses to the COVID-19 crisis. Previously, Stankov and Saucier (2015) replicated the five-factor structure of social axioms at the individual level with participants from 33 cultures and observed pronounced country and region level differences and suggested that these differences should be further investigated. Thus, beyond individual level analysis, the current study will also examine societal-level differences and their association with psychological responses.

In the current study, we aim to explore how social axioms, as stable belief systems, influence individuals' psychological responses to the COVID-19 pandemic, utilizing the tricomponent attitude model (Gilbert et al., 1998), which includes affect (emotional responses), behavior (behavioral responses), and cognition (perceived protection efficacy). We hypothesized that social axioms, measured by five factors, would influence reactions to the pandemic across affective, cognitive, and behavioral dimensions. Apart from the social axioms, other common factors that were potentially associated with psychological responses were also examined and controlled as covariates.

The current study was pre-registered before data collection. The pre-registration is available online (at https://osf.io/ne3xf/). The current study will test the hypotheses below:

H1. Personal worry and normative concerns about risk will be associated with psychological responses; specifically, it will be positively associated with emotional responses and behavioral responses and negatively associated with perceived protection efficacy across cultures.

H2. Social axioms will be associated with emotional responses, behavioral responses, and perceived protection efficacy across cultures; specifically, social cynicism will demonstrate negative impact, whereas reward for application will demonstrate positive impact.

Besides, the following hypotheses will be explored:

H3. Trust will be negatively associated with emotional responses and behavioral responses and positively associated with perceived protection efficacy across cultures.

H4. Additionally, it is expected that the social axioms at the societal level will moderate the associations between predictors (i.e., personal worry, normative concerns, general trust, and trust in institutions) and psychological responses (i.e., emotional responses, behavioral responses, and perceived protection efficacy).

METHODS

Participants and measures

The data collection was conducted through the partnership with an international company Kantar from April 9–20, 2020, in 35 cultures[1] (Chen et al., 2021). The initial sample consisting of 25,605 adults was processed using the stratified sampling technique. As a result, the sample was closely matched with the population characteristics of United Nations across countries and regions. After removing the participants who failed three attention check questions and excluding incomplete responses, the final sample included 18,171 adults[2] (50.2% female, $M_{age} = 43.66$, $SD = 15.97$, ranged from 18 to 91). The sample sizes of the cultural groups were similar and comparable, ranged from 507 (New Zealand) to 530 (Brazil). Informed consent was obtained from all participants prior to their inclusion in the study. Participants completed an online survey containing measures of social axioms (Leung et al., 2012), personal worry and normative concerns (Goodwin et al., 2011), emotional responses (Yeung & Fung, 2007), behavioral responses (Goodwin et al., 2011), perceived protection efficacy (Kim et al., 2016), and trust (Inglehart et al., 2021). Detailed information about these measures is provided in the supporting information appendix.

Analytical approach

To test our hypotheses, multilevel modeling was employed to capture the within- and between-country variations of variables. First, three sets of multilevel regression analysis were conducted on the three dependent variables. Specifically, each psychological response variable (i.e., emotional responses, behavioral responses, and perceived protection efficacy) was regressed onto nine independent variables of personal worry, normative concerns about risk, five social axioms, general trust, and trust in institutions at both the between and within levels. In all models, intercepts and slopes were specified as random at the within level. Second, built upon the three sets of multilevel regression analysis, cross-moderation effects of social axioms were tested. At the societal level, the slopes for personal worry, normative concerns about risk, general trust, and trust in institutions were regressed on one dimension of social axioms at a time, resulting in a total of five models tested in each set.[3] All multilevel regression models were estimated using a robust maximum likelihood estimator, with standard errors calculated using the sandwich estimator. Mplus 8.8 (Muthén & Muthén, 2017) was utilized for the aforementioned analyses.

RESULTS

The descriptive statistics of the variables for each society are presented in Table S1. The results of bivariate correlations (see Table S3) and multilevel regressions supported Hypothesis H1.[4] Of all 35 cultures in the sample, personal worry was positively associated with negative emotional responses, $r(18{,}169) = .46$, $p < .001$, 95% CI [.45, .47]; behavioral responses $r(18{,}169) = .32$, $p < .001$, 95% CI [.30, .33]; and negatively associated with perceived protection efficacy, $r(18{,}169) = -.21$, $p < .001$, 95% CI [−.22, −.19]. The same pattern was observed for normative concerns with relatively small effect sizes: it was positively associated with negative emotional

responses, $r(16{,}518) = .08$, $p < .001$, 95% CI [.06, .10]; behavioral responses, $r(18{,}169) = .13$, $p < .001$, 95% CI [.12, .15]; and negatively associated with perceived protection efficacy, $r(18{,}169) = -.02$, $p = .003$, 95% CI [−.04, −.01]. The correlations between social axioms and psychological responses partially supported Hypothesis H2. Notably, social cynicism demonstrated a positive association with negative emotional responses, $r(18{,}169) = .10$, $p < .001$, 95% CI [.08, .11], and a negative association with perceived protection efficacy, $r(18{,}169) = -.13$, $p < .001$, 95% CI [−.14, −.11], and a small but trivial negative correlation with behavioral responses, $r(18{,}169) = -.02$, $p = .001$, 95% CI [−.04, −.01]. On the other hand, reward for application was positively associated with perceived protection efficacy, $r(18{,}169) = .16$, $p < .001$, 95% CI [.14, .17], but also positively associated with negative emotional responses, $r(18{,}169) = .14$, $p < .001$, 95% CI [.12, .15], and behavioral responses, $r(18{,}169) = .24$, $p < .001$, 95% CI [.23, .26]. Additionally, social complexity, fate control, and religiosity showed either positive or non-significant correlations with psychological responses, which are presented in Table S3. In addition, Hypothesis H3 was also partially supported. The results showed that general trust was negatively associated with negative emotional responses, $r(18{,}169) = -.11$, $p < .001$, 95% CI [−.13, −.10]; behavioral responses, $r(18{,}169) = -.01$, $p < .001$, 95% CI [−.10, −.07] though it was trivial; and positively associated with perceived protect efficacy, $r(18{,}169) = .12$, $p < .001$, 95% CI [.11, .14]. Trust in institutions was positively associated with perceived protect efficacy, $r(18{,}169) = .24$, $p < .001$, 95% CI [.22, .25]; however, it also demonstrated small but positive correlations with negative emotional responses, $r(18{,}169) = .08$, $p < .001$, 95% CI [.06, .09], and behavioral responses, $r(18{,}169) = .06$, $p < .001$, 95% CI [.05, .08].

Initially, we conducted multilevel regression analyses incorporating random intercepts and fixed slopes. We performed separate estimations for each of the three dependent variables: emotional responses, behavioral responses, and perceived protection efficacy. The results yielded coefficients that were nearly identical to those reported below. Next, all nine covariates were incorporated at both within and between levels, with the four within-level slopes simultaneously predicted by a between-level social axiom factor in each model. Consequently, each set comprises five regression models tested for each DV, resulting in a total of three sets, encompassing 15 multilevel regression models, which are outlined in Tables 1 and 2. The coefficients of predictors at both within- and between-levels were mostly identical across models and were summarized only once in the table.

The results revealed that all covariates were significant predictors of emotional responses at the within level. Among all predictors, personal worry ($B = .50$, $p < .001$), normative concern ($B = .02$, $p = .02$), trust in institutions ($B = .02$, $p = .002$), social cynicism ($B = .07$, $p < .001$), fate control ($B = .14$, $p < .001$), reward for application ($B = .07$, $p < .001$), and religiosity ($B = .04$, $p = .001$) positively predicted emotional responses, while negative predictors included general trust ($B = -.11$, $p < .001$) and social complexity ($B = -.04$, $p = .017$). At the between level, fate control emerged as the sole significant positive predictor ($B = .59$, $p = .002$). Regarding behavioral responses, at the within level, personal worry ($B = .21$, $p < .001$), normative concern ($B = .06$, $p < .001$), reward for application ($B = .08$, $p < .001$), and religiosity ($B = .04$, $p < .001$) were significant positive predictors, with general trust remaining a negative predictor ($B = -.04$, $p = .001$). At the between level, normative concern ($B = .32$, $p = .034$) and reward for application ($B = .53$, $p = .007$) served as significant positive predictors. Lastly, for perceived protection efficacy, general trust ($B = .09$, $p < .001$), trust in institutions ($B = .16$, $p < .001$), reward for application ($B = .17$, $p < .001$), and religiosity ($B = .07$, $p < .001$) significantly and positively predicted perceived protection at the within level. In contrast, significant negative predictors included personal worry ($B = -.25$, $p < .001$), social complexity ($B = -.10$,

$p = .001$), and social cynicism ($B = -.09$, $p < .001$). At the between level, only social complexity emerged as a significant positive predictor ($B = 0.98$, $p = .034$). Therefore, Hypotheses H2 and H3 were partially supported.

The results presented in Table 2 reveal that fate control, religiosity, and reward for application were significant negative predictors of emotional and behavioral responses in relation to personal worry at the between-level. This suggested that in societies with elevated levels of fate control, religiosity, or reward for application, the relationships between personal worry and negative emotional as well as behavioral responses were less pronounced. Additionally, in the current study, fate control and religiosity positively predicted the slope of behavioral responses in relation to normative concerns, albeit with relatively small coefficients. This indicated that societies with higher overall levels of fate control and religiosity showed stronger associations between normative concerns and behavioral responses, though such differences might be relatively trivial. In the same vein, religiosity positively predicted the slope of personal worry in relation to perceived protection efficacy but with a relatively small effect size. Thus, Hypothesis H4 was also partially supported.

DISCUSSION

In an effort to examine whether individuals' beliefs influenced their psychological responses during the pandemic and to broaden our understanding of these dynamics on a global scale, the present study gathered and analyzed data from 35 cultures and uncovered associations between social axioms, the general beliefs or principles that people hold about the social world, and psychological responses to the COVID-19 pandemic through multilevel modeling. In line with the tricomponent attitude model (Gilbert et al., 1998), the current study investigated whether social axioms, in addition to personal worry, normative concerns, and trust, influenced participants' affective (emotional responses), behavioral (behavioral responses), and cognitive (perceived protection efficacy) responses to the pandemic. The results highlighted a potential

TABLE 1 Multilevel regression results of personal worry, normative concerns, and social axioms predicting psychological responses towards COVID-19

	Model 1: emotional responses		Model 2: behavioral responses		Model 3: perceived protection efficacy	
Predictors	**Within**	**Between**	**Within**	**Between**	**Within**	**Between**
Personal worry	0.50***	−0.05	0.21***	−0.07	−0.25***	−0.06
Normative concern	0.02*	0.32	0.06***	0.33*	−0.02	−0.08
General trust	−0.11***	−0.11	−0.04**	0.14	0.09***	0.81
Trust in institutions	0.02**	0.06	0.01	−0.01	0.16***	0.01
Social complexity	−0.04*	−0.51	−0.02	0.37	−0.10**	0.98*
Social cynicism	0.07***	0.04	−0.02	−0.21	−0.09***	−0.25
Fate control	0.14***	0.59**	0.02	0.18	−0.02	0.24
Reward for application	0.07***	−0.36	0.08***	0.55**	0.17***	0.5
Religiosity	0.04**	0.15	0.04***	0.1	0.07***	−0.06

*$p < .05$, **$p < .01$, and ***$p < .001$.

TABLE 2 Results of between-level social axioms predicting slope differences

	Model 1: emotional responses				Model 2: behavioral responses				Model 3: perceived protection efficacy			
	Personal worry	Normative concern	General trust	Trust in institutions	Personal worry	Normative concern	General trust	Trust in institutions	Personal worry	Normative concern	General trust	Trust in institutions
Social complexity	0.07	0.01	−0.26	−0.05	0.05	0.09	−0.1	−0.01	0.15	0.16*	−0.05	0.03
Social cynicism	0.12	0.05	−0.12	0.01	0.05	0.03	−0.06	−0.03	0.08	0.03	−0.08	−0.03
Fate control	−0.34***	0.04	0.09	0.01	−0.39***	0.09**	0.09	−0.04	0.09	0.07	0.02	0.04
Religiosity	−0.12***	−0.002	0.04	−0.01	−0.12***	0.03*	0.03	−0.01	0.04*	0.03	0.02	0.01
Reward for application	−0.31***	0.02	0.04	−0.01	−0.35***	0.07	0.04	−0.03	0.11	0.08	0.06	0.03

*$p < .05$, **$p < .01$, and ***$p < .001$.

buffering effect of the societal-level axiom of "dynamic externality" on associations between predictors and psychological responses, beyond the expected individual-level effects.

First, in line with previous literature and our hypothesis, personal worry and normative concerns about risk demonstrated positive associations with emotional and behavioral responses in times of COVID-19, while showing negative associations with perceived protection efficacy across cultures. Personal worry consistently exhibited relatively large effect sizes in both bivariate correlations and multilevel regressions, indicating that individuals' personal experiences and emotions were more relevant during the pandemic compared to their perceptions of others. These findings are consistent with prior research conducted during the swine flu outbreak (Goodwin et al., 2011), which revealed that such worries and concerns correlated with preparatory and avoidance behaviors as well as the presence of intrusive pandemic-related thoughts. Given the significant role of personal worry in individuals' emotional and behavioral responses, it is crucial for mental health professionals, community organizations, and public health campaigns to develop strategies for managing anxiety and stress in crisis interventions. Notably, normative concerns also displayed a significant positive association at the society level when predicting behavioral responses, suggesting that such impact even emerged across cultural groups, and cultural differences in normative perceptions played an important role in governing individuals' pandemic-related behaviors (Latkin et al., 2022). Therefore, effective and cultural specific communication about risks and preventive measures should be emphasized to help alleviate normative concerns and enhance perceived protection efficacy, especially for social groups that exhibit high levels of normative concerns. Public health authorities should prioritize clear, accurate, and timely information dissemination, steering clear of sensationalism while providing practical guidance on how individuals can protect themselves and others.

Furthermore, the findings in our study highlight several key associations between social axioms and psychological responses. The positive association between social cynicism and negative emotional responses indicates that individuals who hold more pessimistic beliefs about human nature might be more prone to experiencing negative emotions during a crisis. The negative association with perceived protection efficacy suggests that people with higher levels of pessimistic beliefs may also feel less confident in the effectiveness of protective measures. Intriguingly, these findings displayed similar patterns in the multilevel analyses, where social cynicism positively correlated with emotional responses and negatively correlated with perceived protection efficacy at the within level, but not with behavioral responses. These results are in line with prior research on the maladaptive functions of social cynicism (Chen et al., 2009; Mak et al., 2011; Tong et al., 2020; Xiu et al., 2016). Additionally, as consistently demonstrated in both bivariate correlations and multilevel regressions, the positive associations between reward for application and perceived protection efficacy, negative emotional responses, and behavioral responses suggest that individuals who believe in the benefits of hard work and persistence may feel more confident in protective measures but could also experience heightened negative emotions and engage in more preventive behaviors. This could be due to their belief that their efforts can make a difference in a challenging situation, leading to increased vigilance and action. In our research, social complexity demonstrated small and trivial associations with negative emotional responses and behavioral responses. However, it showed a significant negative association with perceived protection efficacy at the individual level and a significant positive association with perceived protection efficacy at the societal level. This suggests that individuals with high social complexity may experience lower levels of confidence due to their tendency to perceive the causes of coronavirus from multiple perspectives. As a result, they may perceive the protective measures implemented as inadequate in addressing this

pluralism and therefore feel less confident in the ability of protective measures to address the numerous factors contributing to the spread of the virus. In contrast, the positive association at the societal level may reflect the idea that societies with a greater appreciation for the complexity of social situations are perceived as better prepared to develop comprehensive, adaptive, and nuanced public health policies and interventions. Aligned with previous research (Ng & Chen, 2022), this understanding of complexity might lead to more effective communication and implementation of protective measures, resulting in higher perceived protection efficacy at the societal level.

On the other hand, fate control exhibited a positive association with negative emotional responses. This finding suggests the notion that, when individuals with high levels of fate control perceive that their lives are significantly influenced by external factors beyond their personal control, they may be more likely to experience distress and negative emotions (Krampe et al., 2021; Krause & Stryker, 1984). In the context of the pandemic, people who believe in fate control might feel that their actions have little impact on the course of the crisis or their personal well-being, making them more susceptible to negative emotional responses. It is important to note that the relationship between fate control and psychological responses may vary across different cultures and contexts, as beliefs in fate or external forces can have diverse meanings and implications depending on cultural backgrounds and personal experiences. Lastly, the positive association between religiosity and negative emotional and behavioral responses could be attributed to several factors. For example, strong religious beliefs can potentially amplify individuals' perception of the pandemic as a punishment, test, or divine intervention, which may subsequently contribute to heightened feelings of guilt, fear, or anxiety (Koenig & Larson, 2001). Furthermore, the disruption of religious practices and communal gatherings due to lockdowns and social distancing measures might have exacerbated negative emotions and behavioral responses for those who rely heavily on their faith for emotional support and coping (e.g., reduced church attendance). Under such circumstances, their beliefs regarding the positive social functioning were affected by the interpersonal transmission of virus, which could account for their negative emotional responses as well. Nevertheless, it is worth noting that these outcomes could also be attributed to the diverse nature of religious beliefs and practices across cultures and the intricate relationship between religiosity and psychological well-being. Future studies could delve deeper into the complexity of religiosity and its role within the framework of social axioms, allowing for a more nuanced understanding of these constructs.

At the cultural and societal level, our findings extend beyond previous research by highlighting the buffering effects of fate control, reward for application, and religiosity on the associations between personal worry, normative concern, and psychological responses. These results reveal several significant moderating effects at the societal level, suggesting that these social axioms can serve as protective factors in mitigating the impact of stressors during a crisis. Specifically, we found that cultures with higher overall levels of fate control, religiosity, or reward for application tended to display weaker relationships between personal worry and negative responses. The similar buffering effects of the three dimensions of social axioms are aligned with "dynamic externality" factor identified by Bond, Leung, Au, Tong, de Carrasquel, et al. (2004), in which axioms except social cynicism were grouped into the same factor at the societal level. This societal axiom reflects normative beliefs in society that life events may be influenced by external or spiritual forces beyond an individual's personal control. In essence, the shared external locus of control and positive belief systems tied to these axioms function as psychological buffers at the societal level. Moreover, cultures with higher overall levels of fate

control and religiosity generally exhibited stronger connections between normative concerns and behavioral responses, though these differences were trivial. It is noteworthy that non-significant findings were observed for social cynicism at the society level, a construct dubbed as "Societal Cynicism" by Bond, Leung, Au, Tong, de Carrasquel, et al. (2004). This non-significant association demonstrated through both societal-level correlations and multi-level regression analyses, which aligns with previous research, where societal cynicism demonstrated weaker correlations with other cultural values, indicating that societal cynicism may be a distinct concept with unique characteristics that needs to be delved into in future research.

Nevertheless, our findings showcased the cultural differences in social axioms and their impact on psychological responses, as beliefs and practices can have diverse meanings and implications depending on individual backgrounds and experiences. These societal-level differences in associations suggested that the impact of social axioms may be more coherent within each cultural group than between cultural groups. Individuals within a cultural group tend to share similar values, customs, and social practices, which can lead to more consistent patterns of psychological responses within that group (Na et al., 2010). However, it is essential to acknowledge that there are still considerable diversity and variability in beliefs and values within each group, as well as between societies. In the face of the unprecedented challenges presented by the pandemic, a marked increase in anxiety, depression, and harmful behaviors has been observed among the population (Penninx et al., 2022). It is crucial to recognize that a one-size-fits-all approach is insufficient to address the diverse psychological needs of individuals (Holmes et al., 2020). Both cultural and individual differences should be taken into account when developing mental health interventions during and after the pandemic. Therefore, mental health interventions aimed at supporting well-being during and after widespread disease outbreaks must account for both societal-level and individual-level variance. Tailoring policies to address common psychological needs shaped by cultural outlooks while retaining flexibility to serve differing personal needs could prove most effective.

Our study has several limitations that should be acknowledged. First, with an attempt to gather rapid responses during the pandemic, we were only able to offer cross-sectional evidence from the large number of participants recruited across the globe. Future research should consider adopting longitudinal designs to better understand the causal effects of beliefs and values on individuals' psychological responses during a crisis. It is also important to note that at the time of data collection, countries were at different stages of the COVID-19 outbreak and containment measures taken, leading to fluctuations in citizens' emotional responses. Additionally, as with all multinational research based on self-reports, the results may be subject to potential response biases.

CONCLUSION

The present study examined the influence of social axioms on individuals' psychological responses during the COVID-19 pandemic across 35 cultures, utilizing a sample of 18,171 adults. The findings indicated that, alongside social axioms, personal worry and normative concerns about risk were associated with negative psychological responses. Furthermore, the study identified significant buffering effects of dynamic externality at the societal level. Societies exhibiting higher overall levels of fate control, religiosity, or reward for application demonstrated weaker associations between personal worry and negative responses. By fostering a deeper understanding of these dynamics, future research can inform interventions and policies designed to bolster individual and collective resilience in the face of societal adversity.

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CONFLICT OF INTEREST STATEMENT

The authors declare no competing interests.

DATA AVAILABILITY STATEMENT

The data and codes that support the findings of this study are available from the authors upon reasonable request.

ETHICS STATEMENT

Approval was granted by the Human Subjects Ethics Sub-Committee of the Hong Kong Polytechnic University (No. HSEARS20141003001). This study was performed in accordance with relevant guidelines/regulations. Research involving human research participants was performed in accordance with the Declaration of Helsinki.

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ENDNOTES

[1] The 35 cultures include Argentina, Australia, Brazil, Canada, China, Egypt, Finland, France, Germany, Hong Kong, India, Indonesia, Italy, Japan, Malaysia, Mexico, Netherland, New Zealand, Nigeria, Pakistan, Philippines, Portugal, Russia, South Africa, South Korea, Singapore, Spain, Sweden, Taiwan, Thailand, Turkey, UAE, UK, USA, and Vietnam. The descriptive statistics of measurement for each country can be found in Table S1.

[2] Power analysis was conducted prior to data collection, a sample size of approximately 452 would be recruited from each country/society, yielding at least 80% statistical power.

[3] We conducted separate tests for each model by moderator. It was analytically infeasible to model all cross-moderation effects within a single model due to the limited sample size of 35 countries.

[4] We additionally conducted multilevel regressions including participants' age, sex, and education levels at both the within and between levels of our models. The addition of demographic controls did not significantly alter the regression coefficients for social axioms or other variables, all coefficients remained identical or very close to the results. Additionally, to account for society-difference of COVID-19 experience, we conducted additional multilevel regression analyses that included the stringency index from the COVID-19 Government Response Tracker (Hale et al., 2021) on April 20, 2020 (the end date of our data collection), for all 35 countries. The results demonstrated that the coefficients for the stringency index predicting psychological responses were negligible across outcomes. Therefore, for the sake of simplicity, we did not present or discuss these covariates in the current analyses.

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SUPPORTING INFORMATION

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