Trust is good, control is better: The role of trust and personal control in response to threat

Shiva Pauer, ORCID: 0000-0001-5965-8040¹

Bastiaan T. Rutjens, ORCID: 0000-0003-3163-4156¹

Frenk van Harreveld, ORCID: 0000-0003-3717-2773^{1,2}

¹Department of Social Psychology, University of Amsterdam, The Netherlands

²National Institute for Public Health and the Environment (RIVM), The Netherlands

Corresponding author:

Shiva Pauer, s.pauer@uva.nl

University of Amsterdam, Department of Social Psychology

Nieuwe Achtergracht 129-B, Amsterdam, The Netherlands

ABSTRACT

Individuals oftentimes lack personal control over societal threats and depend on powerful others to manage a threat for them. This lack of control could lead individuals to derive evaluations of threat from beliefs about the trustworthiness of powerful others. Three cross-sectional studies ($N = 1,938$) support the proposed moderation of the correlation of trust with evaluative reactions to risks by personal control. In line with the assertion that individuals evaluate uncontrollable threats by resorting to beliefs about others being willing and able to avert a risk, beliefs in the benevolence of powerful others but no other trustees or trust attributions drive the effects. The findings remained significant when partialling out several effects of potential confounding variables. Moreover, the data indicate that trust in powerful others managing a risk can partially backfire in people who lack personal control by indirectly thwarting behavioral risk responses and policy support for managing the risk.

Key words: Control, knowledge, morality, risk, threat, trust

THE ROLE OF TRUST AND PERSONAL CONTROL IN RESPONSE TO THREAT

For humankind to flourish in the Anthropocene, multiple global risks like pandemics and climate change must be alleviated (United Nations, 2021). Given that such global threats are beyond any individual person's capability to solve, risk mitigation depends particularly on actions by powerful individuals and institutions. However, trust in others managing a risk is negatively associated with problem awareness about the risk (Bord & O'Connor, 1992; Siegrist, 1999, 2000; Visschers & Siegrist, 2013; Wachinger et al., 2013). Actions of powerful individuals and institutions could therefore partially hamper policy support and individual action in the public, even though the overall correlation of trust in powerful others with behavioral risk responses is positive (Cologna & Siegrist, 2020).

Siegrist and Cvetkovich (2000) have shown that trust in government predicts lower risk perception, especially in cases of a lack of perceived knowledge about a risk. They posit that individuals who perceive a lack of knowledge about a risk tend to adopt risk evaluations from experts or authorities who are believed to provide trustworthy evaluations. In other words, a perceived information deficit may motivate individuals to obtain risk assessments from trusted sources. Another explanation for this moderation by knowledge is that individuals who perceive a lack of knowledge about a risk could compensate for it by heuristically deriving evaluations of risks from determinants of the severity of the risk, including especially trust in others who could mitigate the risk (Siegrist, 2021).

Perceived knowledge is a vital aspect of cognition that is oftentimes intertwined with the concept of personal control (Antonovsky, 1996; Friston, 2010; Schulz, 1976; White, 1959). Various theories have argued that individuals strive for control — the perceived ability to influence outcomes through interactions with the environment — as a basic human need that is integral to well-being (e.g., Fritzsche, 2022; Heckhausen & Schulz, 1995; Seligman, 1975). Knowledge can engender a sense of uncontrollability and vice versa (Kellstedt et al., 2008; Milfont, 2012; Shepherd & Kay, 2012), such as when the aversiveness of a control threat motivates individuals to obtain information with the aim to regain a sense of control (Landau et al., 2015; Whitson et al., 2022). This partial interdependence of perceived knowledge and personal control raises the need to isolate their genuine

effects in moderating the trust-risk association. To our best knowledge, there is no published research that has investigated their potentially contending moderating effects. It could therefore be the case that a moderating effect of knowledge is at least in part explained by the effect of personal control.

This is not to say that knowledge and control are the same; knowledge and control perceptions reflect interrelated but distinct phenomena (e.g., Antonovsky, 1996). Perceived knowledge about climate change, for example, will not necessarily grant an individual a sense of control over it. Likewise, we expect that perceived control over a microwave oven only partially leads people to feel knowledgeable about the device. These considerations illustrate the need to distinguish the roles of knowledge and personal control in response to threats.

We propose that personal control perceptions could play an important role in determining the extent to which trust attributions serve as information in evaluative reactions to threats. Individuals can extrapolate evaluations of risks from beliefs about the consequences of others' goals and actions (Boon & Holmes, 1991; Earle et al., 2010; Johnson & Slovic, 1995; Meijers & Rutjens, 2014; Rousseau et al., 1998). Such perceived dependence of outcomes on others controlling a threat should be particularly relevant to evaluative responses if individuals experience an inability to resolve a threat themselves. Specifically, previous research has indicated that trust in secondary parties responding to a threat affords individuals to compensate for a lack of control (Fritsche et al., 2013; Greenaway et al., 2015; Kay et al., 2008; Shepherd & Kay, 2012; van Harreveld & Rutjens, 2020). However, personal control takes primacy over secondary control (Heckhausen et al., 2010; Heckhausen & Schulz, 1995; Rothbaum et al., 1982), such that trust in others will only be relevant if personal control is low. For example, perceived health risks from pesticides in food might partially be derived from the extent to which individuals feel authorities avert the risks for them, particularly if individuals lack a sense of personal control over exposure to pesticides in food. Accordingly, even if people feel knowledgeable about risks, trust attributions should serve as genuine information in evaluating risks that are beyond an individual's sense of control.

In three studies we tested the proposed dependence of the association of trust in powerful others with evaluative reactions to threats on a lack of personal control. Importantly, the studies allowed us to disentangle the moderating effects of personal control, perceived knowledge, and

alternative explanatory variables. The studies further shed light on the implications of the proposed model for understanding the potentially detrimental conditional indirect effects of trust on individual action and policy acceptance (see Figure 1 for the complete model). The studies were approved by ethics committees and the datasets and Supporting Information can be found at OSF (Study 1: osf.io/u5x3r, Study 2 and 3: tinyurl.com/trcor).

Figure 1

Conceptual model of personal control perception moderating the effect of trust on evaluation of threat and, in turn, behavioral responses.

STUDY 1

The first study investigated whether control perception and trust in powerful others interact in predicting risk responses in the context of COVID-19. Our central tenet is that a lack of personal control (compared to when control is high) makes individuals' threat perceptions more dependent on beliefs about whether powerful others can be trusted to avert the threat. In particular, trust in authorities managing COVID-19 should most strongly alleviate risk evaluations in individuals who feel incapable of protecting themselves from the disease.

The moderating effects of personal control and perceived knowledge perceptions could be intertwined to the extent in which, for example, a desire for control motivates individuals to obtain knowledge to regain a sense of personal control (Landau et al., 2015). The present study therefore aimed to compare and disentangle the moderating effects of perceived knowledge and control perceptions on the association of trust with perceived risk. Moreover, the study tested whether the expected interaction effect of trust and control on risk perception also predicts behavioral

consequences. If the conditional effects of trust are translated into behavioral risk responses, this would highlight the predictive value of the proposed model and further underline the importance of control perceptions.

Method

Participants and procedure

The final sample comprised 1,561 participants ($M_{\text{age}} = 46.73$, $SD_{\text{age}} = 16.75$, 57.4% female, 58.5% with university degree) who responded to all items for the key variables. A total of 1,836 volunteer and paid participants have started the survey on Qualtrics. They were recruited through an Australian panel provider ($n = 1,233$) and social media platforms from March 26th to April 12th, 2020. The final sample included participants from 34 countries. The dataset was the first wave of a larger project to track the COVID-19 pandemic, and a subset of the dataset was published in an unrelated project on predictors of COVID-19 health-protective behaviors (Mata et al., 2021). A sensitivity power analysis in the R package *pwr2ppl* (Aberson, 2019) indicated 84.8% power to detect the observed interaction effect of trust with control on risk perceptions, $\beta = .08$, at $p = .05$ in a three-predictor multiple regression. The study would yield 62.1% power to detect a 25% smaller interaction effect on the outcome at $p = .05$.

Materials

We adapted the questionnaire from the COSMO-protocol (WHO, 2020) and presented it in English. We only report the variables relevant to the present hypotheses, all materials can be found at osf.io/u5x3r.

Trust in authorities. In line with Siegrist and Cvetkovich (2000), six items assessed confidence in different health and political authorities anchored by the question “How much confidence do you have that the following authorities can minimize the harm caused by COVID-19?”. The 7-point response scales ranged from *very low confidence* to *very high confidence*. An exploratory factor analysis indicated that the items loaded on a single factor ($\alpha = .90$).

Control perception. Two items measured perceived personal control over COVID-19 as conceptualized by Skinner (1996) in terms of the extent to which participants believe they are the agents of control over action for effecting the target outcome: “For me avoiding an infection with

COVID-19 in the current situation is extremely difficult” (reverse-coded) and “I know how to protect myself from COVID-19”. The 7-point response scales ranged from *completely disagree* to *completely agree* and were aggregated given a sufficiently large correlation, $r = .19$ (Briggs & Cheek, 1986), and separate analyses with each of the two items resulted in the same findings.

Risk perception. Five items assessed evaluations of risks related to COVID-19, e.g., “If I got COVID-19 it would be a severe health threat” (see Supporting Information for all items). Responses were aggregated ($\alpha = .65$), given good inter-item correlations, $r = .26$ (Briggs & Cheek, 1986).

Behavioral risk response. Adherence to safety measures was assessed for five items (washing hands, respiratory hygiene, touching face, physical distance, staying at home) anchored by the following question: “In the past 7 days, how frequently have you taken the following actions to reduce the spread of or prevent infection with COVID-19?”. The 5-point response scales ranged from *not at all* to *always* and were aggregated ($\alpha = .64$), given good inter-item correlations, $r = .26$ (Briggs & Cheek, 1986).

Perceived knowledge. One question assessed perceived knowledge on a 7-point scale ranging from *very poor knowledge* to *very good knowledge*: “How would you rate your knowledge level on COVID-19?”. The focus on perceived knowledge is based on Siegrist and Cvetkovich (2000) who posited that perceived knowledge determines whether people are motivated to base their risk evaluations on trust.

Results

We first report a test of personal control as a moderator of the association of trust in authorities with risk perception and, in turn, behavior (see Figure 1; for summary statistics see Table 1). A moderated mediation model (PROCESS model 7; Hayes, 2013/2018) with standardized coefficients indicated significant main effects of trust in authorities and personal control perception over COVID-19 on risk perception, qualified by a significant interaction effect of the two variables (see Table 2 and Figure 2). Trust was significantly and negatively correlated with evaluations of risk at low control perception, but the correlation was nonsignificant at high control. Moreover, there was a significant indirect effect of trust on reduced safety behavior through risk perception at low control but not at high control (see Table 1). Separate analyses showed that the findings remained similar and

significant after controlling for significant covariates (i.e., education, gender, age) after step-wise exclusions of nonsignificant sociodemographic variables.

Table 1

Summary statistics for Study 1. Note that the items for perceived risk were standardized before aggregation.

	<i>M</i>	<i>SD</i>	<i>Mdn</i>	1.	2.	3.	4.
1. Trust	4.51	1.40	4.60				
2. Personal control	5.16	1.06	5.00	.14***			
3. Perceived knowledge ¹	5.32	1.10	5.00	.16***	.23***		
4. Perceived risk	0.00	1.00	-.26	-.08**	-.19***	.02	
5. Self-reported behavior	4.20	0.56	4.20	.22***	.14***	.23***	.05*

Note. * . $p < .05$; ** . $p < .01$; *** . $p < .001$; ¹ $N = 1,559$. $N = 1,561$.

Table 2

Standardized effects from a moderated mediation analysis with an interaction effect of trust and perceived control on perceived risk and conditional indirect effects on behavioral adherence to safety measures.

Effect	β	95% CI		p
		<i>LL</i>	<i>UL</i>	
Trust	-.056	-.105	-.008	.024
Personal control	-.181	-.230	-.132	<.001
Trust * personal control	.079	.033	.126	<.001
Conditional effects on perceived risk				
at 1 SD below mean control	-.138	-.205	-.070	<.001
at mean control	-.058	-.107	-.009	.020
at 1 SD above mean control	.021	-.046	.089	.538
Conditional indirect effects on behavior				
at 1 SD below mean control	-.010	-.021	-.003	
at mean control	-.004	-.010	.000	
at 1 SD above mean control	.002	-.004	.008	

Note. A total of 49.4% of observations were within the Johnson-Neyman region of significance.

The CI of the index of moderated mediation was above zero, $\beta = .006$, 95% CI [.001, .013]. There were positive direct effects of trust, $\beta = .23$, 95% CI [.18, .28], $p < .001$, and risk perception, $\beta = .07$, 95% CI [.03, .12], $p = .003$, on behavior.

CIs of indirect effects are based on 10,000 bootstrap samples.

CI = confidence interval; *LL* = lower limit; *UL* = upper limit

Figure 2

Standardized conditional effects of trust in authorities on perceived risk at levels of control perception (1.5 SD and 1 SD below the mean, at the mean, and 0.5 SD and 1 SD above the mean, as there were no cases 1.5 SD above the mean) in the context of COVID-19. Each simple slope includes the computed 95% confidence region and percentile (PTCL) as recommended by McCabe et al. (2018).

We aimed to disentangle the effects of personal control and perceived knowledge in moderating the trust-risk association, given that knowledge and control correlated, $r(1559) = .23, p < .001$. However, a simple moderation analysis revealed that the interaction effect of trust and knowledge on risk perception was nonsignificant, $\beta = .01, 95\% \text{ CI } [-0.03, .06], p = .494$, and remained nonsignificant after controlling for significant covariates (i.e., education, gender, age), $\beta = .001, 95\% \text{ CI } [-0.04, .04], p = .950$. Next, we partialled out the potential effects of knowledge by including both control and knowledge as separate moderators in a single model (PROCESS model 2, Hayes, 2013/2018; for a justification of the model specification see Hull et al., 1992; Yzerbyt et al., 2004). Again, there was a significant interaction effect of trust and control on risk perception, $\beta = .09, 95\% \text{ CI } [.04, .14], p < .001$, whereas the interaction effect of trust with knowledge was nonsignificant $\beta = -.02, 95\% \text{ CI } [-0.06, .03], p = .424$. A separate analysis (PROCESS model 3; Hayes, 2013/2018) showed that the three-way interaction effect of trust with control and knowledge was nonsignificant, $\beta = -.04, 95\% \text{ CI } [-0.07, .00], p = .052$.

Discussion

The findings support our model of personal control moderating the trust-risk association, such that distrust in authorities is associated with increased risk perceptions only in people who lack personal control. The moderation effect was not explained by potentially confounding effects of perceived knowledge, indicating that the moderation by perceived control holds irrespective of perceived knowledge. Surprisingly, the data do not yield an interaction effect of trust with knowledge on evaluations of risk (Siegrist & Cvetkovich, 2000). Moreover, the findings highlight value of the proposed model in predicting a partially detrimental effect of trust on behavioral responses (e.g., Cruwys et al., 2021; Meijers & Rutjens, 2014), which contrasts the oftentimes positive main effect of trust on behavior (Cologna & Siegrist, 2020). The moderated mediation analyses reported in the present section and elsewhere, however, do not warrant causal inferences (Bullock et al., 2010). Therefore, Study 2 and 3 aimed to disentangle different components of trust that could drive its interaction effect with personal control. In addition, we aimed at partialling out alternative explanations and potential confounding variables. For instance, one could argue that political orientation could have introduced a spurious interaction effect to the data if conservatism had distinct causal effects on experiences of a lack of control over covid-19, heightened trust in institutions, and low risk perception at the time of data collection (Bruine de Bruin et al., 2020).

STUDY 2

We attempted to replicate Study 1 by testing for an interaction effect of trust in powerful others and personal control perception on risk responses in the context of climate change. In addition, we aimed to strengthen the support for the proposed model by partialling out alternative explanatory variables and by examining which components of trust drive the interaction effect.

While Study 1 assessed trust in authorities in line with Siegrist and Cvetkovich (2000), the present study examined whether the trust-control interaction effect on evaluative reactions to risk is indeed driven by trust in others who have considerable and context-relevant power (i.e., governmental bodies) in comparison to groups of less powerful agents that can intend to mitigate the risk (i.e., the industry and consumers). Governmental institutions are oftentimes in the most powerful position to coordinate risk mitigation (Mazzucato, 2011, 2021; United Nations Development Programme, 2020).

For many challenges “only government has the capacity to steer the transformation on the scale needed” (Mazzucato, 2021, p.23). In the resolution on the Sustainable Development Goals, for example, governments committed to set their “own national targets guided by the global level of ambition but taking into account national circumstances” (United Nations General Assembly, 2015, paragraph 55). Individuals who lack personal control could therefore base their judgment of the scale of a threat especially on their trust in a powerful entity such as government rather than private organizations or consumers.

A precondition for an interaction effect of personal control with trust in powerful others on evaluative reactions to risk is that individuals believe that the trustees will exert context-relevant power benevolently. Trustworthiness perceptions have been conceptualized to encompass three components, including beliefs about a trustee’s benevolence (i.e., having good intentions), ability (i.e., having influence), and integrity (i.e., adhering to an appropriate set of principles; Colquitt et al., 2007; Mayer et al., 1995). Benevolence attributions have been shown to take precedence over other attributions and guide the interpretation of ability attributions (Earle et al., 2010; Eisenbruch & Krasnow, 2022; Fiske et al., 2007; Wojciszke et al., 1998). As such, individuals who lack personal control could base their evaluations especially on beliefs about the (un)willingness of powerful others to mitigate a risk. For example, climate change might appear more dreadful to powerless individuals who are threatened by floods and believe authorities are unwilling to do anything they can to alleviate the risk. In contrast, individuals who regain some personal control over flood defence (e.g., by installing flood-proof materials or buying a flood insurance; Lo, 2013) will feel less dependent on the benevolence of authorities in evaluating the risk.

We controlled for variables that could potentially account for variance in the effects of trust and control on evaluative reactions to risk as recommended given the observational nature of the data (Rohrer, 2018), i.e., denial of responsibility for risk mitigation (Bichard & Kazmierczak, 2012; Gosling et al., 2006; Kellstedt et al., 2008), hope for scientific progress resolving the threat (Hornsey & Fielding, 2016; Rutjens et al., 2010; Schilke et al., 2015), political orientation (Hornsey et al., 2016; Većkalov et al., 2021), and the affect heuristic (Siegrist, 2021; Slovic et al., 2004). These variables could confound the proposed conditional effect of trust by influencing two or more variables in the

model, such as by producing a spurious interaction effect through systematically impacting on personal control and the effects of trust.

Method

Participants and procedure

We collected valid data from 296 first-year students at a large University in the Netherlands ($M_{\text{age}} = 19.88$, $SD_{\text{age}} = 2.59$, 84.8% female) who participated on Qualtrics in return for research credits. We targeted a sample of 300 participants based on feasibility. Eight participants (2.3%) were excluded as they failed pre-determined attention checks, i.e. seven persons failed a question that asked to select “completely agree” and one person had a median speed per item below 2 sec. (i.e., 1.53s per item; Huang et al., 2012; Wood et al., 2017). A sensitivity power analysis in the R package *pwr2ppl* (Aberson, 2019) indicated a 85.0% power to detect the observed interaction effect of trust with control on the outcome, $\beta = -.16$, at $p = .05$ in a three-predictor multiple regression. The study would yield a 62.9% power to detect a 25% smaller interaction effect on the outcome at $p = .05$.

Materials

Trust. We measured beliefs in ability, benevolence, and integrity as distinct components of trustworthiness (adapted from Mayer & Davis, 1999; Siegrist et al., 2003; van Harreveld & Rutjens, 2020). Each of the three components was assessed using two questions, both of which were answered on three response scales for “the government”, “the industry”, and “consumers” (for the items and internal consistencies see Table 3). The 18 items were averaged to nine composite scores, every one reflecting one component of trustworthiness of one entity, such as governmental benevolence. In addition, we measured general trust in the three actors for dealing with climate change on one scale each, anchored by a question adapted from Siegrist (2000). This allowed us to test whether generalized trust or distinct trustworthiness components drive the effects in the proposed model. The 7-point response scales ranged from *not at all* to *very much*.

Table 3

Inter-item correlations and items for trust and trustworthiness in Study 2, each of which was assessed on three response scales for different stakeholders, i.e., “the government”, “the industry”, and “consumers”.

Component	Item(s)	Stakeholders	<i>r</i>
General Trust	-How much trust do you have in the following stakeholders that they will deal with climate change in an appropriate way?	The government	/
		The industry	/
		Consumers	/
Benevolence	-To what degree do you think the following stakeholders try to counteract climate change?	The government	.56
		The industry	.45
	-Do you perceive the following stakeholders to be motivated to stop climate change?	Consumers	.52
Ability	-To what degree do you think the following stakeholders are capable of stopping climate change?	The government	.38
		The industry	.32
	-To what degree do you perceive the following stakeholders to have the expertise required to stop climate change?	Consumers	.32
Integrity	-To what degree do you think the following stakeholders stick to their words regarding climate change?	The government	.52
		The industry	.50
	-Do you perceive the actions of the following stakeholders in regard to climate change to be driven by the right values and principles?	Consumers	.34

Control perception. Two items measured personal control (adapted from Armitage & Conner, 1999): “How much personal control do you feel you have over performing behaviour that helps to stop climate change?”, “To what extent do you feel you have control over whether climate change will be stopped?”. The 7-point response scales ranged from *not at all* to *very much* ($r = .41$).

Risk perception. We assessed evaluations of psychological distance to climate change (Spence et al., 2012) as a standardized measure of evaluative reactions to risk in addition to a self-developed measure of generalized risk perception. Psychological distance to climate change has been conceptualized to disentangle different components of risk perception, i.e., the perceived social, temporal, geographical, and hypothetical distance of climate change, with distant risks being perceived as less risky (Spence et al., 2012). Psychological distance was measured using a 4-item

scale (Spence et al., 2012), e.g. “My local area is likely to be affected by climate change”. Higher scores indicate higher psychological distance to climate change ($\alpha = .71$).

In addition, we devised a generalized risk perception scale based on previous work by Leiserowitz (2006) and van der Linden (2017). Three items measured evaluations of likelihood and severity of climate change, besides an item for general concern: “How likely do you think it is that climate change has serious negative consequences?”, “How serious of a threat do you believe negative consequences of climate change are to humans and nature?”, “How concerned are you about climate change?”. The 7-point response scales ranged from 1 – *not at all* or *very unlikely* to 7 – *very much* or *very likely* and were averaged ($\alpha = .83$).

Behavioral intentions. Intentions for climate-related behaviors were assessed with 10 items (based on Lange & Dewitte, 2019; Nielsen et al., 2021; Tobler et al., 2012). Two items measured generalized pro-environmental intention (e.g., “I am willing to take actions to counteract climate change”) and eight items addressed specific behaviors (e.g., charitable donation, plastic usage; for details see Supporting Information). The 7-point response scales were averaged ($\alpha = .75$).

Policy acceptance. We assessed acceptance of policy instruments to combat climate change on one item (adapted from Hardisty et al., 2019): “How much do you support or oppose policy measures to counteract climate change, such as an increase in CO₂ taxes, if they raise the price of unsustainable consumption?”. The 7-point response scale ranged from *completely oppose* to *completely support*.

Perceived knowledge. Two questions asked participants to report their perceived knowledge (adapted from (Milfont, 2012; Pauer & Čavoјová, in prep.; Siegrist & Cvetkovich, 2000): “Compared to others, such as your friends, how much do you feel you know about climate change?” on a 7-point response scale ranging from *far less* to *far more*; “How well-informed do you consider yourself to be on global warming and climate change?” on a 7-point scale ranging from *not at all* to *very much*. Responses were standardized and averaged ($\alpha = .72$).

Negative affect. To control for the affect heuristic (Siegrist, 2021; Slovic et al., 2004), we asked participants “To what extent do you experience the following emotions when you think about climate change?” and presented a list of seven items from Wang et al. (2018): Ashamed, sad, fearful,

angry, hopeless, uncertain, confused. Responses were assessed on 7-point scales from *not at all* to *very much* and averaged ($\alpha = .72$).

Responsibility. Two questions assessed attributions of responsibility for climate change (adapted from Jang, 2013) about “the government”, “the industry”, “and consumers”: “To what degree do you think each of the following stakeholders are responsible for how the climate has changed over the last 50 years?”, “To what degree do you think the following stakeholders should take actions to stop further climate change?”. The 7-point response scales ranged from *not at all* to *very much* and were averaged to three scores.

Hope for scientific progress. Two items measured hope for scientific progress for resolving climate change: “I believe scientists will find ways to stop climate change”, “Technical solutions will solve problems caused by climate change”. Responses were assessed on 7-point scales ranging from *completely disagree* to *completely agree* and averaged ($\alpha = .73$).

Results and discussion

Firstly, we examined the main model of personal control moderating the effect of beliefs in governmental benevolence on psychological distance to climate change and, in turn, individual action (for summary statistics see Table 4). In line with Study 1, a moderated mediation model (PROCESS model 7; Hayes, 2013/2018) with standardized coefficients indicated significant main effects of beliefs in governmental benevolence and personal control perception over climate change on psychological distance, qualified by an interaction effect of the two variables (see Table 5 and Figure 3). Specifically, beliefs in governmental benevolence were significantly and positively correlated with psychological distance at low personal control but not at high control. Moreover, there was a significant indirect effect of benevolence on reduced behavioral intention through psychological distance at low but not at high control (see Table 5). The findings remained similar after partialling out the effect of potential covariates and alternative explanations, in particular the affect heuristic, hope for scientific process, political orientation, and sociodemographics (see Supporting Information for details).

Table 4

Summary statistics of key variables in Study 2.

	<i>Mdn</i>	<i>M</i>	<i>SD</i>	1.	2.	3.	4.	5.
1. Governmental benevolence	3.50	3.58	1.22					
2. Personal control	2.00	2.69	1.27	.02				
3. Perceived knowledge	4.50	4.44	1.00	-.05	.27***			
4. Psychological distance	2.67	2.74	1.15	.16**	-.18**	-.25***		
5. Behavioral intention	5.26	5.18	0.79	-.03	.29***	.40***	-.27***	
6. Policy support	6.00	5.48	1.20	-.09	.13*	.36***	-.26***	.33***

Note. *. $p < .05$; **. $p < .01$; ***. $p < .001$. $N = 296$.

Table 5

Standardized effects from a moderated mediation analysis with an interaction effect of governmental benevolence and perceived control on psychological distance to climate change and, in turn, intentions to counteract climate change (Study 2).

Effect	β	95% CI		p
		<i>LL</i>	<i>UL</i>	
Belief in governmental benevolence	.15	.04	-.26	.009
Personal control	-.19	-.30	-.08	<.001
Benevolence * personal control	-.16	-.27	-.05	.004
Conditional effects on psych. distance				
at 1 SD below mean control	.35	.18	.52	<.001
at mean control	.14	.03	.26	.011
at 1 SD above mean control	.01	-.15	.16	.939
Conditional indirect effects on intention				
at 1 SD below mean control	-.10	-.17	-.04	
at mean control	-.04	-.08	-.01	
at 1 SD above mean control	.002	-.05	.05	

Note. A total of 55.7% of observations were within the Johnson-Neyman region of significance.

The CI of the index of moderated mediation was above zero, $\beta = .04$, 95% CI [.01, .09]. The direct effect of benevolence on intention was nonsignificant, $\beta = .02$, 95% CI [-.10, .13], $p = .788$, the direct effect of psychological distance was significant, $\beta = -.27$, 95% CI [-.39, .16], $p < .001$.

CIs of indirect effects are based on 10,000 bootstrap samples.

CI = confidence interval; *LL* = lower limit; *UL* = upper limit.

Figure 3

Conditional effects of beliefs in governmental benevolence on psychological distance at levels of control perception (1 SD and 0.5 SD below the mean, at the mean, and 1 SD and 1.5 SD above the mean) in the context of climate change (Study 2).

There was no significant interaction effect when replacing variables in the model by other components of trustworthiness (i.e., ability or integrity), trustworthiness of other actors (i.e., industry or consumers), generalized trust in any of the actors, or hope for scientific progress, $ps > .05$. These findings expand on Study 1 by providing conceptual support for a moderation of the trust-risk association by personal control, given that its moderation effect was specific to beliefs in benevolence of the government.

As in Study 1, we tested for a moderating role of perceived knowledge. A simple moderation analysis revealed that the interaction effect of governmental benevolence and knowledge on psychological distance was nonsignificant, $\beta = -.03$, 95% CI [-0.14, .09], $p = .678$, just as when entering any of the other trustworthiness or trust variables as an independent variable, $ps > .05$. However, knowledge and control correlated, $r(296) = .27$, $p < .001$. We therefore partialled out the effects of knowledge by including both control and knowledge as moderators in a single model (Yzerbyt et al., 2004). Again, there was a significant interaction effect of benevolence and control on psychological distance, $\beta = -.16$, 95% CI [-0.27, -.05], $p = .004$, while the interaction effect of benevolence and knowledge was nonsignificant, $\beta = .02$, 95% CI [-0.10, .14], $p = .756$. A separate

analysis showed that there was no significant three-way interaction effect, $\beta = -.04$, 95% CI $[-.15, .08]$, $p = .554$. These findings replicate Study 1 by indicating that it is control perception rather than knowledge that moderates the effect of perceived trustworthiness of powerful others on evaluations of climate change.

The study included a self-developed scale of generalized risk perception as an additional outcome as well as responsibility attribution scales as a covariate. However, there were substantial ceiling effects on these scales, which decreases statistical power and indicates poor validity and usefulness of the measures (Feng et al., 2014; Levine & Dunlap, 1982). Specifically, 31% to 67% of participants reported maximum risk perception scores. After log transformation, the expected interaction effect of belief in governmental benevolence with personal control on perceived risk only approached significance but in the expected direction, $b = 0.03$, 95% CI $[0.00, 0.07]$, $p = .078$, $\eta_p^2 = .01$. Likewise, there were 22.3% to 49.0% cases at the ceilings of responsibility attributions, which played nonsignificant roles in the proposed model when controlling for them in the main analyses above. We thus tested for a role of responsibility attributions in Study 3 as well.

We further examined the predictive value of our proposed model for policy acceptance (PA) by employing a moderated mediation model with PA as an outcome. There was a significant negative indirect effect of benevolence on PA through psychological distance at low control, $\beta = -.09$, 95% CI $[-.16, -.03]$, and at medium control, $\beta = -.04$, 95% CI $[-.08, -.01]$, but not at high control, $\beta > -.01$, 95% CI $[-.05, .04]$. The index of moderated mediation was significant, $\beta = .04$, 95% CI $[.01, .08]$, indicating significant pairwise differences between the conditional indirect effects. The direct effect of benevolence on PA was nonsignificant, $\beta = -.05$, 95% CI $[-.16, .07]$, $p = .412$, the direct effect of psychological distance was significant, $\beta = -.25$, 95% CI $[-.36, -.14]$, $p < .001$. The findings remained the same after controlling for political orientation. As such, beliefs in authorities being motivated to avert climate change are correlated with a partially detrimental effect on support for their climate-related policy instruments through lower problem awareness in people who lack personal control.

STUDY 3

In a final study, we aimed to replicate and extend the finding that individuals who lack control may derive problem awareness from beliefs in the trustworthiness of powerful others. While Studies 1

and 2 assessed evaluative reactions to risks that pose proximal threats to participants, the present study was designed to generalize those findings to evaluations in a domain with potentially heightened salience of moral risk for other individuals. Specifically, we employed the domain of animal production for meat consumption, which is a highly moralized topic (Feinberg et al., 2019; Hartmann & Siegrist, 2020) that involves moral uncertainty (MacAskill et al., 2020), such as in evaluating the moral status of farmed animals and their suffering (Caviola et al., 2019, 2020; Weathers et al., 2020). Individuals can feel exposed to moral risks when endorsing meat consumption and accepting the possibility of animal suffering in meat production (Bastian & Loughnan, 2017; Hartmann & Siegrist, 2020; Loughnan et al., 2014). As such, the study investigated the extent to which evaluations of meat consumption depend on an interaction of personal control with trust related to animal suffering in meat production.

Method

Participants and procedure

We collected valid data from 104 first-year students at a large University in the Netherlands ($M_{\text{age}} = 20.10$, $SD_{\text{age}} = 2.82$, 76.7% female) who participated on Qualtrics in return for research credits. We targeted a sample of at least 100 participants. The study description excluded vegetarians and vegans given that we assessed intentions to eat less meat as an outcome variable. A total of 12 participants (10.3%) were excluded as they failed pre-determined attention checks, i.e. they failed at least one out of two questions that asked to select “completely disagree” or “very much”, respectively. The survey was run in a test session after a study on information processing.

We targeted a final sample of 100 participants based on feasibility and our expectation of a heightened effect size, given that individuals draw especially on benevolence attributions in moral contexts (Earle et al., 2010; Eisenbruch & Krasnow, 2022; Wojciszke et al., 1998). A sensitivity power analysis in the R package *pwr2ppl* (Aberson, 2019) indicated 80.1% power to detect an interaction effect of trust with personal control on the outcome, $\beta = -.28$, at $p = .05$ in a three-predictor multiple regression. The study would yield 57.4% power to detect a 25% smaller interaction effect on the outcome.

Materials

Trustworthiness. As in Study 2, three questions assessed beliefs in benevolence, ability, and integrity with regard to “farmed animal suffering” each for “the industry”, “the government”, and “consumers” (see Supporting Information for the items). The nine 7-point response scales ranged from *not at all* to *very much*.

Control perception. We devised four items to measure personal control (based on Ajzen, 2002; Armitage & Conner, 1999; Zur & Klöckner, 2014), e.g., “How much personal control do you feel you have over the impact that your meat consumption has on the world?” (see Supporting Information for all items). We designed the items to encompass a broad range of distinct facets that constitute control perception, in particular efficacy beliefs, controllability, and domain-general control in line with previous research (Ajzen, 2002; Grothmann & Patt, 2005; Meinhold & Malkus, 2005; Skinner, 1996). Internal consistency was unacceptable, $\alpha = .45$, as the behavioral control item had weak inter-item correlations, $r_s < .10$. We therefore excluded the item, which did not change the study findings but resulted in $\alpha = .57$ and, more importantly given the small number of items, good inter-item correlations, $r_s > .28$ (Briggs & Cheek, 1986).

Evaluative reactions. We assessed evaluations of meat consumption as a response to moral risk. Two split semantic differential scales (Kaplan, 1972) assessed evaluative reactions: “Considering only the positive [/negative] aspects of meat consumption, while ignoring the negative [/positive] aspects, how positive [/negative] are your thoughts and/or feelings regarding meat consumption?”. The 9-point response scales ranged from *not at all positive[/negative]* to *very positive[/negative]*. We employed this type of scale to disentangle positive from negative evaluations and ambivalent from indifferent evaluations (Kaplan, 1972; van Harreveld et al., 2009, 2015), given that ambivalence towards meat is widespread (Buttlar et al., 2022; Pauer et al., 2022). Congruently, the two items correlated only weakly, $r = -.20$, $p = .043$.

Behavior. We adapted two items from Graça et al. (2015) to assess intentions to eat less meat: “Are you willing to reduce your meat consumption?”, “Do you plan to follow a more plant-based diet within the next year?”. The 7-point response scales ranged from *not at all* to *very much* ($\alpha = .79$). As a performance-based instrument, participants recalled and wrote down their meat

consumption frequency in terms of the number of “lunch and dinner meals [...] in a regular week, for instance last week, that contain meat” (Pauer et al., 2022).

Perceived knowledge. As in Study 2, we measured perceived knowledge on one item with a 7-point response scale from *not at all* to *very much*: “How well-informed do you consider yourself to be about the treatment of animals in livestock farming?”.

Responsibility. One question assessed attributions of responsibility to “the industry”, “the government”, “consumers”, and “yourself”: “To what degree do you think each of the following stakeholders is responsible for preventing farmed animal suffering?”. The 7-point response scales ranged from *not at all* to *very much*.

Results and discussion

As a replication of Study 1 and 2, we first report a moderated mediation model (Hayes, 2013/2018) of a conditional indirect effect of beliefs in governmental benevolence on behavioral intention through positive evaluation, with a significant moderation effect by personal control (see Table 6 and Figure 4; for summary statistics see Table 7). Specifically, beliefs in governmental benevolence were significantly correlated with positive evaluation of meat at low control perception but not at medium or high control. Likewise, there was a significant indirect effect of benevolence on reduced intentions through positivity at low control but not at high control. The findings remained similar after controlling for sociodemographics and responsibility diffusion. The same pattern of findings resulted from including a performance-based measure of behavior (i.e., recall of meat consumption frequency) as an outcome variable instead of intention. Specifically, the index of moderated mediation was significant, $\beta = -.07$, 95% CI $[-.14, -.01]$, with a significant indirect effect of benevolence on behavior at low control, $\beta = .09$, 95% CI $[.02, .19]$, but not at medium, $\beta = .03$, 95% CI $[-.02, .08]$, or high control, $\beta = -.04$, 95% CI $[-.13, .02]$.

Table 6

Standardized effects from a moderated mediation analysis with an interaction effect of governmental benevolence and perceived control on positive evaluation and, in turn, behavioral intention (Study 3).

Effect	β	95% CI		<i>p</i>
		<i>LL</i>	<i>UL</i>	
Belief in governmental benevolence	.12	-.06	.31	.195
Personal control	-.13	-.32	.07	.201
Benevolence * personal control	-.28	-.47	-.10	.004
Conditional effects on positivity				
at 1 SD below mean control	.41	.15	.67	.002
at mean control	.12	-.06	.31	.195
at 1 SD above mean control	-.16	-.43	.11	.245
Conditional indirect effects on intention				
at 1 SD below mean control	-.15	-.28	-.06	
at mean control	-.05	-.12	.02	
at 1 SD above mean control	.06	-.04	.17	

Note. A total of 45.2% of observations were within the Johnson-Neyman region of significance.

The CI of the index of moderated mediation was above zero, $\beta = .11$, 95% CI [.03, .20]. The direct effect of benevolence on intention was nonsignificant, $\beta = .09$, 95% CI [-.27, .10], $p = .362$, the direct effect of positive evaluation was significant, $\beta = -.37$, 95% CI [-.56, .19], $p < .001$.

CIs of indirect effects are based on 10,000 bootstrap samples.

CI = confidence interval; *LL* = lower limit; *UL* = upper limit.

Table 7*Summary statistics of key variables in Study 3.*

	<i>M</i>	<i>SD</i>	<i>Mdn</i>	1.	2.	3.	4.	5.
1. Governmental benevolence	3.07	1.35	3.00					
2. Personal control	-0.58	1.50	0.00	.06				
3. Perceived knowledge	4.10	1.58	4.00	.09	.00			
4. Positive evaluation	5.30	1.49	6.00	.13	-.05	-.13		
5. Behavioral intention	4.95	1.50	5.00	-.13	.04	-.11	-.38***	
6. Self-reported behavior	5.66	3.53	5.00	.18 [†]	.02	-.09	.25* [†]	-.40***

Note. [†]. $p = .074$, * $p < .05$. *** $p < .001$. $N = 104$.

Figure 4

Conditional effects of beliefs in governmental benevolence on positive evaluation at levels of personal control perception (-1 SD and -0.5 SD below the mean, at the mean, and 0.5 SD and 1 SD above the mean) in Study 3.

Interestingly, the interaction effect of control and governmental benevolence was only significant on positive evaluation but not when testing negative evaluation as the outcome, $\beta = .11$, 95% CI [-0.09, .31], $p = .272$. Note that while we measured negative and positive evaluations separately because they vary independently (Kaplan, 1972), an aggregated attitude favorability score of the two variables (Itzhakov et al., 2020) would yield the same and significant pattern of findings as positive evaluation, with a significant interaction effect of benevolence and control on attitude

favorability, $\beta = -.23$, 95% CI $[-.42, -.04]$, $p = .019$. The exploratory finding of a centrality of positive evaluation in the consequences of the interaction of trust with control perceptions indicates the possibility of a valence asymmetry in the interaction effect. This seems in line with the notion that governmental bodies could whitewash policies related to animal welfare (Cole, 2011; Gall, 2021; Woods, 2012), which arguably allows individuals to maintain positive evaluations of meat despite moral concerns (Bastian & Loughnan, 2017). As such, the valence asymmetry in the interaction of trust with control perception might possibly depend on the extent to which individuals moralize an attitude object.

We finally examined potential alternative variables involved, i.e., other trustworthiness components and perceived knowledge. In line with Study 2, there was no significant moderation effect of personal control when replacing the independent variable by other components of trustworthiness (i.e., ability or integrity) or other trustees (i.e., the industry or consumers), $ps > .05$. Next, a simple moderation analysis revealed that the interaction effect of governmental benevolence and knowledge on positive evaluation was nonsignificant, $\beta = -.03$, 95% CI $[-.14, .09]$, $p = .678$, just as when sequentially entering the other trustworthiness variables as an independent variable, $ps > .05$. Next, we partialled out the effects of knowledge by including both control and knowledge as moderators in a single model. Now as before, there was a significant interaction effect of governmental benevolence and personal control on positive evaluation, $\beta = -.31$, 95% CI $[-.50, -.12]$, $p = .002$, while the interaction effect of benevolence and knowledge was nonsignificant, $\beta = -.12$, 95% CI $[-.30, .05]$, $p = .165$. A separate analysis showed that there was no significant three-way interaction effect, $\beta = -.09$, 95% CI $[-.28, .09]$, $p = .319$.

The findings replicate and extend Study 1 and 2 by indicating that the belief in benevolence of powerful others managing a moral risk rather than other trustworthiness components or other trustees is associated with evaluative responses and, in turn, increased behavioral inaction in people who lack control. This finding held after controlling for perceived knowledge and attributions of responsibility. These findings provide converging evidence for the assumption that a lack of personal

control over a threat leads individuals to draw their evaluations from beliefs in the trustworthiness of powerful others.

GENERAL DISCUSSION

Trust plays a crucial role in risk perception (e.g., Cruwys et al., 2021; Siegrist, 2021). One explanation for this role may be that individuals oftentimes depend on powerful others controlling a threat. Specifically, the present work indicates that trust attributions provide individuals with important information for evaluating threats that are beyond their personal ability to control. In three studies, we show that personal control moderates the effect of trust in authorities on evaluative reactions to threats, such that trust attributions about powerful others become relevant to evaluative reactions only if individuals lack personal control. This finding held irrespective of potentially alternative explanations such as perceived knowledge (Siegrist & Cvetkovich, 2000), the affect heuristic (Slovic et al., 2004), denial of responsibility (e.g., Gosling et al., 2006), and political orientation (e.g., Hornsey et al., 2016; Večkalov et al., 2021). Moreover, the conditional effect of trust seems to be driven by beliefs in benevolence of powerful others rather than other trustworthiness components or trustees (Studies 2 and 3), which further supports the idea that evaluations of risk can be derived from beliefs about the willingness and ability of others to resolve a risk.

The present work was intended to add to Siegrist and Cvetkovich (2000)'s suggestion that a perceived lack of knowledge leads individuals to draw risk evaluations from trust in others. One of our aims was to examine the extent to which the potentially moderating roles of perceived knowledge and personal control are complementary or mutually exclusive. Although personal control played a pivotal role in our data, future research should address whether its effect differs across domains of risk. Specifically, our studies utilized diverse risk domains, i.e., health risk, moral risk, and environmental risk, but it would be interesting to explore differences between clusters in an even broader range of risk domains. For example, one could argue that the magnitudes of self-threat elicited by lack of personal control (Rutjens & Kay, 2017) and lack of knowledge (e.g., Shepherd & Kay, 2012) differ, such that the effect of the moderator with higher self-threat might be more pronounced in self-relevant risks than in other risks like psychologically distant risks (e.g., Schubert et al., 2019).

Additional boundary conditions of the interaction effects of trust with perceived knowledge and control perceptions could also concern differences between trustees. For instance, a moderation effect of knowledge could be more pronounced than a moderation effect of personal control for trust in experts who are not responsible for managing a problem in the public interest. Given that this group of experts has no decisive power over averting the threat, personal control should not influence the effect of the respective trust attributions on threat-related evaluations after controlling for perceived knowledge. Such a pattern of findings would expand on Siegrist (2021)'s assumption that a moderation of the trust-risk association by knowledge holds for trust in authorities, the industry, and experts alike.

Surprisingly, perceived knowledge did not moderate the effects of trust on our outcome variables, unlike previous research (Siegrist & Cvetkovich, 2000). Future research could investigate in particular the aforementioned boundary conditions to attempt a conceptual replication of an interaction of trust with perceived knowledge. Furthermore, Siegrist and Cvetkovich (2000)'s assertion that an information deficit leads individuals to obtain risk assessments from trusted sources, which in turn influences risk evaluations and thus engenders a moderation by perceived knowledge, could be tested using more comprehensive models that disentangle the proposed processes involved in the effects of trust, information acquisition, and risk evaluation (Brick et al., 2022; Shepherd & Kay, 2012).

All in all, the present studies indicate pivotal importance of a moderating effect of personal control on the association of trust in powerful others and perceived risks. However, they only tentatively address the more specific motivational and cognitive underpinnings of personal control that drive the interaction with trust. While we aimed to provide evidence for a role of generalized control perception, follow-up research could explore potentially varying effect sizes of distinct facets of control like behavioral control, control over domain-specific outcomes, collective control, power, and domain-general control (Bandura, 1977; Fritzsche, 2022; Greenaway et al., 2015; Nordgren et al., 2007; Rutjens et al., 2010; Whitson et al., 2022). This question could provide insights into which cognitive antecedents and motivational consequences of the facets of personal control influence its

moderating role and whether trust in powerful others affords individuals to regain a sense of control (Greenaway et al., 2015; Hornsey et al., 2015).

A limitation of our data is the absence of experimental manipulations that warrant causality of the findings (Bullock et al., 2010; Siegrist, 2021). Future research should address this limitation by manipulating control and trust perceptions (e.g., Rutjens et al., 2010; Schilke et al., 2015). In line with best practice advice (Rohrer, 2018), however, the findings remained significant above and beyond potentially alternative explanations such as a role of perceived knowledge, the affect heuristic, denial of responsibility, and political orientation. Moreover, we only assessed self-report measures of attitudinal and behavioral variables, which are prone to systematic biases (e.g., Klein & Kunda, 1993; Leviston & Uren, 2020). Although self-reports are predictive of actual behavior (Kormos & Gifford, 2014), future research should run longitudinal and experimental field studies for converging evidence. However, we consistently observed the detrimental conditional indirect effect of trust on behavioral and attitudinal variables across three studies and five behavioral outcomes, justifying the following considerations for risk communication.

Crucially, powerful actors such as governmental bodies that manage risk control may potentially absolve individuals from going along with necessary actions when people experience a lack of personal control. These findings add to previous research that has revealed detrimental effects of trust (e.g., Cruwys et al., 2021; Meijers & Rutjens, 2014) by suggesting that the detrimental effects can depend on a lack of personal control. This caveat informs research that utilizes trust in interventions to mitigate societal problems (e.g., Brick et al., 2021; Gainsburg et al., 2022). Especially transparent and empowering risk communication that fosters personal control in individuals together with problem awareness could potentially prevent the detrimental effect of trust. Such communication strategies could become increasingly important in the Anthropocene as human well-being hinges on experts and governmental bodies steering collective action and resolving unprecedented risks.

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