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Uncertainty in flux

The temporal dynamics of attitudinal ambivalence and risk perception

Pauer, S.

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CHAPTER 5

Trust is Good, Control is Better:
The Role of Trust and Personal Control
in Response to Threat

This chapter is based on:

Pauer, S., Rutjens, B. T., & van Harreveld, F. (2024, forthcoming). Trust is Good, Control is Better: The Role of Trust and Personal Control in Response to Threat. *Journal of Applied Social Psychology*. <https://doi.org/10.1111/jasp.13058>

Abstract

Individuals often lack personal control over societal threats and depend on powerful others to manage these threats on their behalf. This lack of personal control could lead individuals to derive threat evaluations from the trustworthiness of powerful others. Three cross-sectional studies ($N = 1,938$) support this proposed interaction of trust with personal control in diverse domains (i.e., the coronavirus pandemic, the climate crisis, and farmed animal suffering). In line with the assertion that individuals evaluate uncontrollable threats by resorting to beliefs about powerful others' willingness to avert a threat, beliefs in the benevolence of governmental bodies, but no other trustees or trust attributions, drive the effects of trust on threat perceptions depending on personal control. The findings remained the same even when controlling for potential confounding variables, such as perceived knowledge, the affect heuristic, responsibility attributions, and political orientation. Furthermore, the data indicate that trust in powerful others managing a threat partially backfires in people who lack personal control by indirectly thwarting behavioral responses and policy support for managing the threat. The present findings advance the understanding of why trust predicts perceptions of threat and suggest that trust has partially detrimental consequences for managing threats that are beyond an individual's sense of personal control.

Introduction

For humankind to flourish in the Anthropocene, multiple global hazards 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. Trust in others managing a threat affords people to alleviate experiences of uncertainty and tolerate vulnerability regarding the threat (Earle & Cvetkovich, 1995, 1997; Siegrist, 2021). However, such trust is negatively associated with problem awareness about the threat (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.

Siegrist and Cvetkovich (2000) have shown that trust in authorities predicts lower societal risk perceptions, especially in cases of a lack of perceived personal knowledge (i.e., subjective knowledge) about a risk. They posit that individuals who perceive themselves to have 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. A second explanation of this moderation by subjective knowledge is that individuals compensate for information deficits by deriving risk evaluations from heuristic cues, especially trust in others who could mitigate a risk (Siegrist, 2021).

Subjective knowledge plays a vital role in comprehending the world and is often intertwined with personal control (Antonovsky, 1996; Friston, 2010; Schulz, 1976; White, 1959). This partial interdependence of subjective knowledge and personal control raises the need to isolate their genuine effects in moderating the effect of trust in response to threat. 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 subjective knowledge is at least in part explained by an alternative effect of personal control. The present research therefore aimed to investigate the moderating effect of personal control and test its role against the moderation by subjective knowledge. In addition, we investigated the downstream consequences on behavioral responses and policy support.

The Role of Personal Control in Response to Threat

Subjective knowledge and personal control perceptions reflect interrelated but distinct phenomena (e.g., Antonovsky, 1996). Lacking subjective 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 is not to say that subjective knowledge and personal control are the same. Subjective 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 subjective knowledge and personal control in response to threats.

Individuals strive for feeling a sense of control as a basic human need (Heckhausen & Schulz, 1995; Seligman, 1975). Various theories have therefore investigated the role of

personal control in intraindividual processes and societal dynamics, for example by investigating self-efficacy beliefs, collective control, and compensatory control (Bandura, 1977; Fritsche, 2022; Kay et al., 2009; Lazarus & Folkman, 1984; Rutjens et al., 2009, 2018). In the present research, we adopt a broad conceptualization of personal control in terms of the perceived ability to influence outcomes and achieve aims through interactions with the environment; this conceptualization encompasses both efficacy beliefs and outcome expectations (Hamann et al., 2023; Skinner, 1996).

A sense of personal control can serve as a psychological resource and protect against threats (Fritsche, 2022; Hamann et al., 2023; Kay et al., 2009; Lazarus & Folkman, 1984; Whitson et al., 2022; Witte & Allen, 2000). In the context of societal risks, personal control deficits correlate with risk perception (Slovic, 1987). McKenna (1993), for instance, showed that individuals perceive less traffic risks when they drive a car compared to being the passenger, but only in controllable (compared to uncontrollable) scenarios. By the same token, risk communication influences perceived control over a threat (Hornsey et al., 2015; Nordgren et al., 2007). Beyond the bidirectional associations between control and risk perception, personal control has been investigated as a moderator of responses to other threats than risks, such as in the context of stress (Baron & Kenny, 1986). For example, high job demands may lead to stress in people who lack a sense of being in control compared to people who perceive control (Karasek, 1979). We build on this moderating perspective on personal control to provide novel insights into why trust predicts threat perception.

The Interaction between Personal Control and Trust

We propose that personal control perceptions play a crucial role in determining the impact of trust attributions on threat perceptions. Social interdependences make individuals vulnerable to the actions of powerful others and give rise to interplays between personal control and trust (Kay et al., 2009; Mooijman, 2023; Mooijman et al., 2019; Rutjens et al., 2018; Shockley & Shepherd, 2016; Weiss et al., 2020). In particular, people can extrapolate threat perceptions 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 to control a threat should be particularly relevant to evaluative responses if individuals experience an inability to resolve the threat themselves. Specifically, previous research has indicated that trust in powerful others for secondary control affords individuals to compensate for a lack of personal control (Fritsche et al., 2013; Greenaway et al., 2015; Kay et al., 2008; Shepherd & Kay, 2012). However, personal control takes primacy over secondary control through powerful others (Heckhausen et al., 2010; Heckhausen & Schulz, 1995; Rothbaum et al., 1982), such that trust in others will only be relevant in threat perception 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 these risks for them, particularly if individuals lack a sense of personal control over minimizing exposure to pesticides in their food. Given that personal control deficits motivate individuals to rely on others who offer secondary control (Greenaway et al., 2015; Kay et al., 2009; Shepherd & Kay, 2012), we expect that trust alleviates threat perceptions in people who lack personal control.

Accordingly, even if people feel knowledgeable about a threat, trust attributions should serve as genuine information in evaluating the threat if it is beyond an individual's

sense of control. Personal control may therefore complement or compete with subjective knowledge in moderating the effect of trust on threat perception proposed in earlier research (Earle et al., 2010; Siegrist, 2021; Siegrist & Cvetkovich, 2000). Moreover, as a downstream consequence of the proposed moderating effect of personal control, trust in others mitigating a threat could lead to paradoxical indirect effects in people who lack a sense of personal control. Specifically, if perceptions of secondary control through trusted others absolve individuals from acknowledging threats, such underestimations of threats could thwart policy acceptance and engagement in individual-level responses to those threats.

Overview of the Present Studies

In three cross-sectional studies we examined the suggested moderation of the impact of trust in powerful others on threat perceptions by a lack of personal control (see Figure 1 for a conceptual model). We propose that our model provides insight into the antecedents of evaluative reactions to risks and related psychological threats. As our rationale relies on the risk and threat literatures, our studies not only investigated risk perception as an outcome (i.e., beliefs and evaluations concerning dangers and uncertainties; Slovic, 1992) but also examined responses to threat more broadly. Specifically, the studies applied our model to predict risk perception (Study 1 and 2), psychological distance (Study 2), and generalized attitudinal evaluations (Study 3). An overview of the studies and their focal constructs is presented in Table 1. We further validated the model and its societal relevance by investigating its downstream implications for individual action and policy acceptance. Moreover, the present set of studies allowed us to disentangle the moderating effects of personal control and subjective knowledge, besides alternative explanatory variables. The datasets and supplementary materials are openly available at OSF (Study 1: https://osf.io/embw8?view_only=425cdd1148e8458c89417756cea5d412, Study 2 and 3: https://osf.io/nyt7r/?view_only=18e48b2fd54743498b8b6c36ac604d60). While the studies were not preregistered, the sample sizes and exclusion methods were determined in advance, and no data were analyzed beforehand.

Figure 1

Conceptual Model of Personal Control Perception Moderating the Effect of Trust on Threat Perception and, in Turn, Behavioral Responses

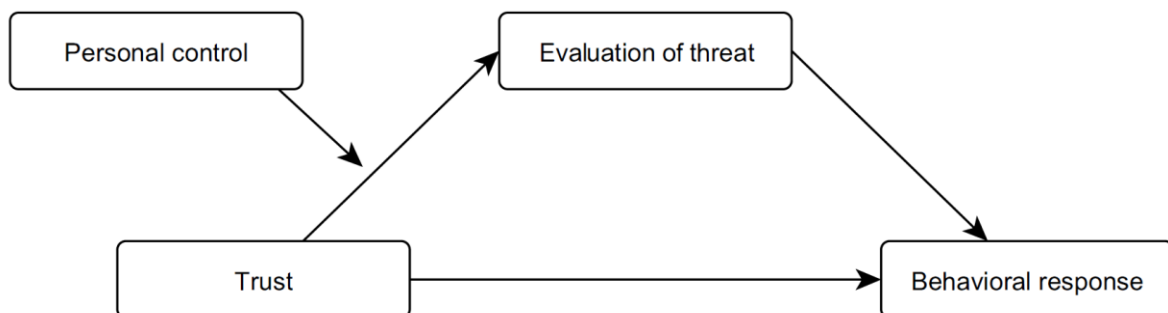


Table 1

Overview of the Present Studies and their key Constructs and Findings in the Contexts of the Coronavirus Pandemic (Study 1), the Climate Crisis (Study 2), and Farmed Animal Suffering (Study 3)

	Key findings			
	Predictor	Moderator	Outcomes	Additional variables
Study 1	Competence-based trust in authorities	Personal control over actions and outcomes	Perceived risk, recalled behavior	Perceived knowledge
Study 2	Benevolence-based trust in authorities	Personal control over actions and outcomes	Psychological distance, intentions, policy acceptance	Perceived knowledge; benevolence-, integrity-, competence-based and general trust in the industry, authorities, and consumers; negative affect; hope; responsibility attributions; perceived risk; political orientation
Study 3	Benevolence-based trust in authorities	Multi-dimensional personal control perception	Positive evaluation, attitude favorability, intentions, recalled behavior	Perceived knowledge; benevolence-, integrity-, competence-based trust in the industry, authorities, and consumers; negative evaluation; responsibility attributions

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 perceived risk in individuals who feel incapable of protecting themselves from the disease.

In addition, we expected a moderating role of subjective knowledge (Earle et al., 2010; Siegrist, 2021; Siegrist & Cvetkovich, 2000). The moderating effects of personal control and subjective 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 subjective knowledge and control perceptions on the association of trust with perceived risk.

Moreover, the study tested whether the expected interaction effect between trust and control on risk perception also predicts behavioral consequences. If the conditional effects of trust manifest in detrimental effects on behavioral engagement in risk mitigation, this would highlight the predictive value of our proposed model and further underline the importance of personal control.

Method

Participants and Procedure

The final sample comprised 1,561 participants ($M_{age} = 46.73$, $SD_{age} = 16.75$, 57.4% female, 58.5% with university degree) who responded to the variables of our model (see Figure 1). 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 dataset was the first wave of a larger project to track the COVID-19 pandemic (i.e., scrubcovid19.org), and a subset of the dataset was published in an unrelated project on predictors of COVID-19 health-protective behaviors (Mata et al., 2021). While the present study was not preregistered, the sample size was determined by feasibility, and we did not exclude any participants or analyze any data before finishing data collection. 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 perception, $\beta = .08$, 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). We only report the variables relevant to the present hypotheses; all materials and the dataset of Study 1 can be found at osf.io/wv7dx/?view_only=425cdd1148e8458c89417756cea5d412.

Competence-based Trust in authorities. In line with Siegrist and Cvetkovich (2000)'s study on the trust-knowledge interaction effect on risk perception, six items assessed competence-based trust (i.e., 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 ($\alpha = .90$).

Personal 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). Note that a robustness check with separate analyses with each of the two items as single-item moderators of the trust-risk association resulted in the same findings as reported in the results section.

Risk perception. Based on classical recommendations for assessing risk perception (Leiserowitz, 2006; Slovic, 1987; S. van der Linden, 2017), we devised a risk perception scale by measuring five items on the perceived severity and probability of the threat. The general severity of COVID-19 was measured on a 7-point response scale from strongly disagree to strongly agree: "If I got COVID-19 it would be a severe health threat". Two items asked participants to evaluate the infection risk for themselves or others, e.g. "What is your probability of getting infected with COVID-19 over the next 12 months?". Likewise, participants estimated the mortality risk from an infection for themselves or others on two

items, e.g. “If an average person in your community (outside your family or household) became infected with COVID-19 over the next 12 months, what is their probability of dying from the disease?”. Responses were standardized and aggregated ($\alpha = .65$), given good inter-item correlations, $r = .26$ (Briggs & Cheek, 1986).

Self-reported behavior. Retrospective adherence to safety measures was assessed on five recall measures of risk responses (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).

Subjective knowledge. One question assessed perceptions of personal 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 subjective knowledge is based on Siegrist and Cvetkovich (2000) who posited that subjective knowledge determines whether people are motivated to base their risk evaluations on trust.

Results

Analyses on Personal Control

We first report a test of personal control as a moderator of the association of competence-based trust in authorities with risk perception and, in turn, behavior (see Figure 1; for summary statistics see Table 2). A moderated mediation model (PROCESS model 7; Hayes, 2013/2018) with standardized coefficients indicated significant main effects of competence-based 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 3 and Figure 2). Competence-based trust was significantly and negatively correlated with perceived risk at low control perception, but the correlation was nonsignificant at high control. Moreover, there was a significant indirect effect of competence-based trust on reduced safety behavior through risk perception at low control but not at high control (see Table 3). Separate analyses showed that the findings remained similar and significant after controlling for significant covariates (i.e., education, gender, age) after stepwise exclusions of nonsignificant sociodemographic variables.

Table 2

Summary Statistics for Study 1 (With Risk Items Being 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 3

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 in Study 1

	β	95% CI		<i>p</i>
		<i>LL</i>	<i>UL</i>	
Trust	-.058	-.105	-.008	.020
Personal control	-.183	-.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	

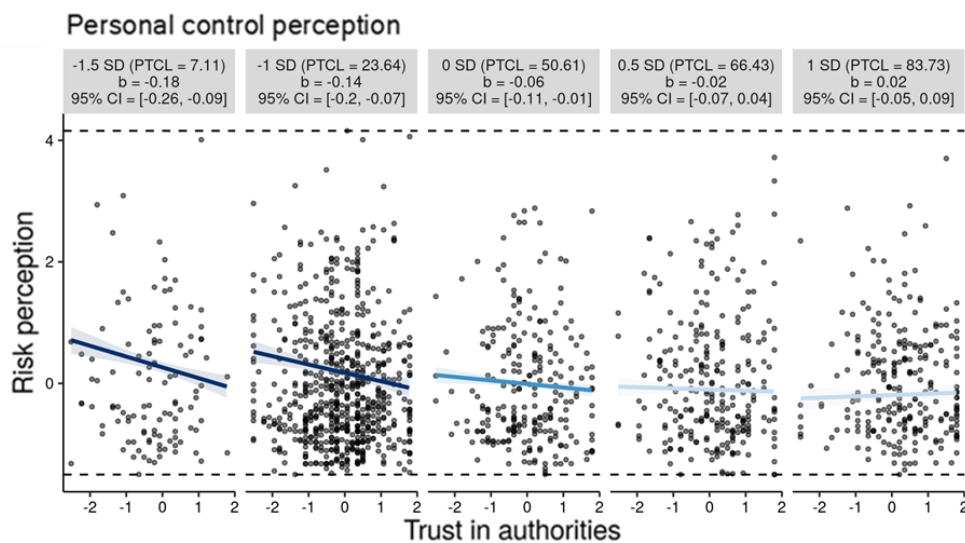
Note. A total of 49.4% of observations were within the Johnson-Neyman region of significance. The CI of the index of moderated mediation was above zero, $\beta = .006$, 95% CI [.001, .013]. There were positive direct effects of trust, $\beta = .23$, 95% CI [.18, .28], $p < .001$, and risk perception, $\beta = .07$, 95% CI [.02, .12], $p = .004$, 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 Competence-Based Trust in Authorities on Perceived Risk at Levels of Control Perception in Study 1 (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; and Each Simple Slope Includes the Computed 95% Confidence Region and Percentile, PTCL, as Recommended by McCabe et al.; 2018)



Personal Control vs. Subjective Knowledge

We aimed to disentangle the effects of personal control and subjective 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 between competence-based trust and knowledge on risk perception was nonsignificant, $\beta = .01, 95\% \text{ CI } [-.03, .06], p = .532$, and remained nonsignificant after controlling for significant covariates (i.e., education, gender, age), $\beta = .001, 95\% \text{ CI } [-.04, .04], p = .950$. 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 competence-based trust in authorities and control on risk perception, $\beta = .09, 95\% \text{ CI } [.04, .14], p < .001$, whereas the interaction effect of competence-based trust with knowledge was nonsignificant $\beta = -.02, 95\% \text{ CI } [-.06, .02], p = .382$.

Discussion

The findings support our model of personal control moderating the trust-risk association, such that competence-based trust in authorities is associated with lower risk perception only in people who lack personal control. The moderation effect was not explained by potentially confounding effects of subjective knowledge, indicating that the moderation by perceived control holds irrespective of subjective knowledge. Surprisingly, the data yield nonsignificant interaction effects between trust in authorities and subjective knowledge on evaluations of risk (cf. Siegrist & Cvetkovich, 2000). Moreover, the findings highlight value of the proposed model in explaining a partially detrimental effect of trust on self-reported behavioral responses (e.g., Cruwys et al., 2021; Meijers & Rutjens, 2014), which contrasts the typical positive main effect of trust on behavior (Cologna & Siegrist, 2020).

The study is limited in a number of ways. First, the items that measured personal control correlated only weakly, perhaps due to suboptimal phrasing of one of the items. While a robustness check yielded the same results when using each of the two control perception items in separate moderation models, Study 2 and 3 addressed this issue by employing a better measures of personal control, Second, the moderated mediation analyses reported in the present section and elsewhere do not warrant causality (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 this way, we addressed a limitation of the present study, as it only measured competence-based trust but not general trust and other trustworthiness components. 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 and extend Study 1 by testing for an interaction effect between trust in powerful others and personal control perception on threat perception in the context of climate change. In addition, we aimed to strengthen the support for our proposed model by partialling out alternative explanatory variables and by examining which components of trust drive the interaction effect.

While Study 1 assessed competence-based trust in authorities in line with Siegrist and Cvetkovich (2000), the present study examined whether the trust-control interaction effect on threat perception 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 nonetheless intend to mitigate the threat (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 between personal control and trust in powerful others 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 threat perception especially on beliefs about the perceived (un)willingness (i.e., benevolence) of powerful others to mitigate the threat. 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 hazard. In contrast, individuals who gain some personal control over flood defense (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 several variables that might arguably explain parts of the interaction effect between trust and personal control on threat perception as recommended given the observational nature of the data (Rohrer, 2018). Specifically, to partial out possible spurious associations within our conceptual model, we controlled for political orientation; political ideology can influence information processing and resistance to change, which affect trust dynamics and threat perceptions (Jost et al., 2003; Kunda, 1990). Such effects could confound our model if conservatives reported lower control perceptions, more trust, and climate change denial (e.g., Hornsey et al., 2016; Većkalov et al., 2021). Similarly, affective reactions to a threat influence judgments of that threat (i.e., the affect heuristic; Fischhoff et

al., 1978; Loewenstein et al., 2001; Slovic et al., 2004) and trust attributions (Visschers et al., 2011), such that one could argue that the effects of trust and affect compete in response to threat. For example, Siegrist (2021) argued that the large number of stakeholders involved in the context of solar energy might lead individuals who feel unknowledgeable to evaluate it based on affective reactions to the technology rather than on trust attributions. While the effects of trust typically go beyond the affect heuristic (Siegrist, 2021), we nonetheless aimed to partial out shared variance to isolate the genuine impact of trust. Finally, we measured responsibility attributions (Gosling et al., 2006; Heider, 1958; Kellstedt et al., 2008) and hope for scientific progress resolving the threat (Hornsey & Fielding, 2016; Rutjens et al., 2010; Weinstein, 1980). Attributing responsibility to external actors and being overly optimistic about scientific solutions as a means of averting threats could compete with the interaction effect of trust with personal control. Overall, by accounting for these important theoretical constructs, we aim to provide a more comprehensive understanding of the dynamics at play in the interaction between trust and personal control in shaping threat perception.

Method

Participants and Procedure

We collected valid data from 296 first-year students at a 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 exhibited a median speed of less than 2 sec. per item (i.e., 1.53s per item; Huang et al., 2012; Wood et al., 2017). While the study was not preregistered, the sample size and exclusion method were determined in advance, and no data were analyzed beforehand. 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 4). 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 4

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	Survey Question(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? -Do you perceive the following stakeholders to be motivated to stop climate change?	The government	.56
		The industry	.45
		Consumers	.52
Ability	-To what degree do you think the following stakeholders are capable of stopping climate change? -To what degree do you perceive the following stakeholders to have the expertise required to stop climate change?	The government	.38
		The industry	.32
		Consumers	.32
Integrity	-To what degree do you think the following stakeholders stick to their words regarding climate change? -Do you perceive the actions of the following stakeholders in regard to climate change to be driven by the right values and principles?	The government	.52
		The industry	.50
		Consumers	.34

Personal 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* ($r = .41$). This measure extends Study 1 by assessing both behavioral control and control over outcomes for a more comprehensive operationalization of personal control, aligning with our multi-dimensional conceptualization of personal control perception (Hamann et al., 2023; Skinner, 1996).

Risk perception. We assessed evaluations of psychological distance to climate change (Spence et al., 2012) as a standardized measure of evaluative reactions to climate change in addition to a self-developed measure of generalized risk perception. Psychological distance to climate change has been conceptualized to disentangle 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 actions were measured by 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 actions (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*.

Subjective knowledge. Two questions asked participants to indicate their perceptions of personal knowledge (adapted from Milfont, 2012; 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., 2004b), we measured negative affect related to climate change. 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

Main Analyses on Personal Control

First, we examined the main model of personal control moderating the effect of benevolence-based trust in authorities (i.e., beliefs in governmental benevolence) on psychological distance to climate change and, in turn, intention for climate-friendly behavior (for summary statistics see Table 5). In line with Study 1, a moderated mediation model (PROCESS model 7; Hayes, 2013/2018) with standardized coefficients indicated significant main effects of benevolence-based trust and personal control perception over climate change on psychological distance, qualified by an interaction effect of the two variables (see Table 6 and Figure 3). Specifically, benevolence-based trust was 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-based trust on reduced behavioral intention through psychological distance at low but not at high control (see Table 6). 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 5

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 6

Standardized Effects From a Moderated Mediation Analysis With an Interaction Effect between Benevolence-Based Trust in Authorities (i.e., Governmental Benevolence) and Perceived Control on Psychological Distance to Climate Change and, in Turn, Intentions to Counteract Climate Change (Study 2)

	β	95% CI		p
		<i>LL</i>	<i>UL</i>	
Governmental benevolence	.15	.04	-.26	.009
Personal control	-.19	-.30	-.08	<.001
Governmental 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	

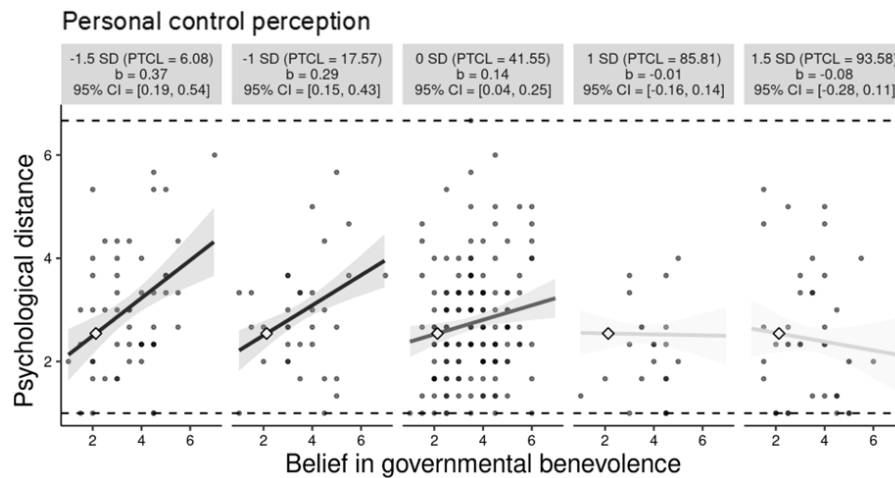
Note. A total of 55.7% of observations were within the Johnson-Neyman region of significance. The CI of the index of moderated mediation was above zero, $\beta = .04$, 95% CI [.01, .09]. The direct effect of governmental benevolence on intention was nonsignificant, $\beta = .02$, 95% CI [-.10, .13], $p = .788$, 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 Benevolence-Based Trust in Authorities on Psychological Distance at Levels of Control Perception in Study 2 (1 SD and 0.5 SD Below the Mean, at the Mean, and 1 SD and 1.5 SD Above the Mean)



There was no significant interaction effect when replacing variables in the model by other components of trustworthiness (i.e., ability- or integrity-based trust), 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 additional support for a moderation by personal control, while indicating a primary role of benevolence-based trust in authorities in our model.

Personal Control vs. Subjective Knowledge

As in Study 1, we tested for a moderating role of subjective knowledge in the effect of trust on psychological distance. A simple moderation analysis revealed that the interaction effect of benevolence-based trust in authorities 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, subjective knowledge and personal 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-based trust in authorities and control on psychological distance, $\beta = -.16$, 95% CI [-0.27, -.05], $p = .004$, while the interaction effect of benevolence-based trust in authorities and knowledge was nonsignificant, $\beta = .02$, 95% CI [-0.10, .14], $p = .756$. These findings replicate Study 1 by indicating that it is control perception rather than knowledge that moderates the effect of trust in evaluations of climate change.

Additional Analyses

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). One reason for these ceiling effects may be a high problem awareness of the climate crisis among the student sample in this study. Specifically, 31% to 67% of participants

reported maximum risk perception scores. After log transformation of the risk perception scale, the expected interaction effect between benevolence-based trust in authorities and personal control on perceived risk only approached significance but in the expected direction, $b = 0.03$, 95% CI [0.00, 0.07], $p = .078$, $\eta^2 = .01$. 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. However, given the limited conclusiveness of the responsibility attribution scales, we tested for a role of responsibility attributions in Study 3 as well.

Policy Acceptance

We further examined the predictive value of our proposed model for policy acceptance by employing a moderated mediation model with policy acceptance as an outcome. There was a significant negative indirect effect of benevolence-based trust in authorities on policy acceptance through psychological distance at low personal 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 did not include zero, $\beta = .04$, 95% CI [.01, .08], indicating significant pairwise differences between the conditional indirect effects. The direct effect of benevolence on policy acceptance 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 have a partially detrimental association with support for their climate-related policy instruments through higher psychological distance to climate change in people who lack personal control.

STUDY 3

In a final study, we aimed to replicate and extend the finding that individuals who lack personal control may derive responses to threats from benevolence-based trust in powerful others. While Studies 1 and 2 investigated the psychological dynamics involved in health and environmental risks that pose rather proximal threats to participants, the present study was designed to apply our proposed model to predict more general attitudinal evaluations in a domain involving more pronounced moral threat.

Specifically, we employed the context of animal production for meat consumption, which is a moralized topic (Feinberg et al., 2019; Hartmann & Siegrist, 2020). The topic involves moral uncertainty (MacAskill et al., 2020; Singer, 1979/2011), such as in evaluating the moral status of farmed animals and their suffering (Caviola et al., 2019, 2020; Weathers et al., 2020) and in making conflicted food choices in everyday life (Pauer, Rutjens, et al., 2024). A large number of individuals therefore report feeling threatened with regard to meat consumption due to animal suffering and death in the process of meat production (Buttlar et al., 2023; Buttlar & Pauer, 2024; Loughnan et al., 2014; the topic involves also perceived threats from interpersonal, health, and environmental risks, albeit to a substantially smaller extent; see Buttlar et al., 2023). Congruently, previous research has argued that institutions like government bodies and the industry protect people from these moral threats involved in animal production, allowing individuals to maintain unconflicted positive evaluations of meat consumption (Bastian & Loughnan, 2017).

As such, the study investigated the extent to which evaluations of meat consumption depend on an interaction between personal control and trust related to animal suffering in meat production. The study thereby extrapolated beyond previous contexts of societal risks in Study 1 and 2 by applying our conceptual model to predict general attitudinal reactions (rather than risk perception) in a domain involving moral threat. In addition, the study employed a more comprehensive operationalization of personal control in line with our theoretical background. Specifically, we aimed to measure the multi-dimensional nature of a sense of personal control (Hamann et al., 2023; Skinner, 1996).

Method

Participants and Procedure

We collected valid data from 104 first-year students at a 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. While the study was not preregistered, the sample size and exclusion method were determined in advance, and no data were analyzed beforehand.

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): “To what degree do you think the following stakeholders are capable of preventing farmed animal suffering?” (i.e., ability); “Do you perceive the actions of the following stakeholders in regard to farmed animal suffering to be driven by the right values and principles?” (i.e., integrity); “Do you perceive the following stakeholders to be motivated to stop farmed animal suffering?” (i.e., benevolence). The nine 7-point response scales ranged from *not at all* to *very much*.

Personal control perception. We further improved the personal control measures used in Study 1 and 2 by devising four items for measuring the multi-dimensional nature of personal control perception (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; Hamann et al., 2023;

Meinhold & Malkus, 2005; Skinner, 1996). These facets reflect distinct components of control perceptions and influence each other, manifesting in a broad sense of personal control (Hamann et al., 2023; Skinner, 1996). Given this theoretical background of our conceptualization of personal control, Study 3 was aimed at extending Study 1 and 2 by employing a multi-dimensional measure of personal control. 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. This 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 threat. 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 (Buttlar, Pauer, & van Harreveld, 2024; Kaplan, 1972; van Harreveld et al., 2015; van Harreveld, van der Pligt, et al., 2009), given that ambivalence toward meat is widespread (Buttlar, Pauer, Ruby, Chambon, Jimenez-Klingberg, et al., 2023b; Pauer, Rutjens, et al., 2023). Congruently, the two items correlated only weakly, $r = -.20$, $p = .043$.

Behavioral intentions. We adapted two items from Graça et al. (2015) and Pauer et al. (2022) 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* ($\alpha = .79$).

Self-reported behavior. As a retrospective measure of behavior, 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, Rutjens, Ruby, et al., 2022).

Subjective knowledge. As in Study 2, we measured perceptions of personal 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. Given that the responsibility scales used in Study 2 yielded severe ceiling effects, Study 3 measured this variable again. 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

Analyses on Personal Control

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 (i.e., benevolence-based trust in authorities) on behavioral intention through positive evaluation, with a significant moderation effect by personal control (see Table 7 and Figure 4; for summary statistics see Table 8). Specifically, benevolence-based trust in authorities 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-based trust in authorities on reduced intentions through positivity at low personal control but not at high control. The findings remained the same after controlling for sociodemographics and responsibility attributions, just like in Study 2.

The same pattern of findings resulted from including a self-report 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-based trust in authorities on recalled behavior at low personal 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 7

Standardized Effects From a Moderated Mediation Analysis With an Interaction Effect Between Benevolence-Based Trust in Authorities (i.e., Governmental Benevolence) and Perceived Control on Positive Evaluation and, in Turn, Behavioral Intention (Study 3)

	β	95% CI		<i>p</i>
		<i>LL</i>	<i>UL</i>	
Governmental benevolence	.12	-.06	.31	.195
Personal control	-.13	-.32	.07	.201
Governmental 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 governmental 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 8

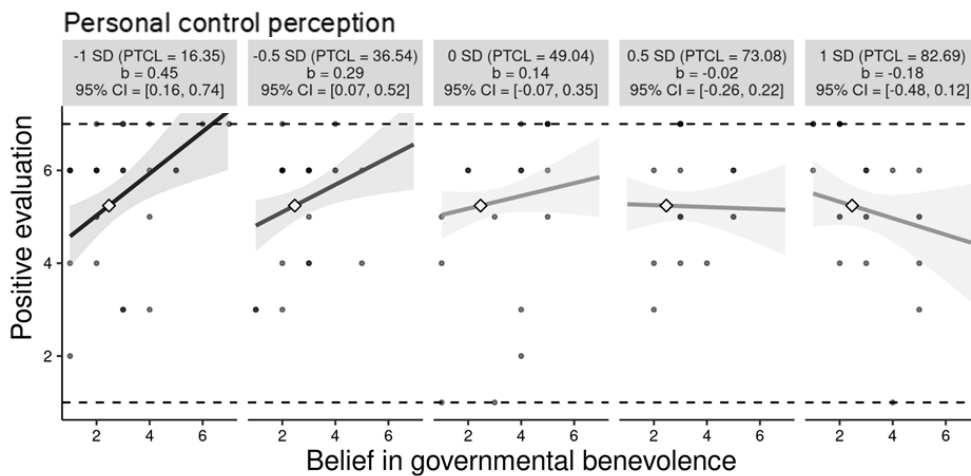
Summary Statistics of key Variables in Study 3

	<i>M</i>	<i>SD</i>	<i>Mdn</i>	1.	2.	3.	4.	5.
1. Benevolence-based trust in authorities	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 Benevolence-Based Trust in Authorities on Positive Evaluation at Levels of Personal Control Perception in Study 3 (-1 SD and -0.5 SD Below the Mean, at the Mean, and 0.5 SD and 1 SD Above the Mean)



Interestingly, the interaction effect of personal control and benevolence-based trust in authorities 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 [-0.42, -.04], $p = .019$. The exploratory finding of a primary role 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 aligns with the assertion that governmental bodies sometimes understate suffering of farmed animals (Cole, 2011; Gall, 2021; Woods, 2012), which arguably allows individuals to more easily maintain positive evaluations of meat despite moral concerns (Bastian & Loughnan, 2017; Buttlar & Pauer, 2024). We examined potential roles of other trust attributions in the moderating role of personal control in predicting positive evaluations. In line with Study 2, there was no significant moderation effect of personal control when replacing the benevolence-based trust in authorities by other components of trustworthiness (i.e., ability- or integrity-based trust) or other trustees (i.e., the industry or consumers), $ps > .05$.

Personal Control vs. Subjective Knowledge

A simple moderation analysis revealed that the interaction effect between benevolence-based trust in authorities and subjective knowledge on positive evaluation was nonsignificant, $\beta = -.03$, 95% CI [-0.14, .09], $p = .678$, just as when sequentially entering the other trustworthiness variables as an independent variable, $ps > .05$. Next, we partialled out potential effects of knowledge by including both personal control and subjective knowledge as moderators of the effect of benevolence-based trust in authorities in a single model. Now as before, there was a significant interaction effect between benevolence-based trust in authorities and personal control on positive evaluation, $\beta = -.31$, 95% CI [-0.50, -.12], $p =$

.002, while the interaction effect between benevolence-based trust in authorities and subjective knowledge was nonsignificant, $\beta = -.12$, 95% CI [-.30, .05], $p = .165$.

Overall, the findings replicate and extend Study 1 and 2 by showing that benevolence-based trust in authorities (rather than other trustworthiness components or other trustees) correlates with evaluative responses to moral threat and, in turn, increased behavioral inaction in people who lack personal control. This finding held after controlling for subjective knowledge and attributions of responsibility. The study thus provides converging evidence for the assumption that a lack of personal control over a threat leads individuals to draw on the perceived trustworthiness of powerful others.

General Discussion

Trust plays a crucial role in threat perception (e.g., Cruwys et al., 2021; Siegrist, 2021). One explanation of this role is 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 threat perception, such that trust attributions to powerful others become relevant only in individuals who lack a sense of personal control. This finding held irrespective of potentially alternative explanations such as subjective knowledge (Siegrist & Cvetkovich, 2000), the affect heuristic (Slovic et al., 2004b), responsibility attributions (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 threat perception can be derived from beliefs about the willingness of powerful others to resolve a threat.

The present work was intended to add to Siegrist and Cvetkovich (2000)'s finding that individuals who feel unknowledgeable draw their risk perceptions from trust in powerful others. One of our aims was to examine the extent to which the potentially moderating roles of subjective knowledge and personal control are complementary or mutually exclusive. Although personal control played a pivotal role in our data, future research should explore whether its effect differs across threat domains. Specifically, our studies utilized diverse domains, i.e., health risk, moral threat, and environmental risk, but there might be differences between clusters in an even broader range of domains (e.g., Earle et al., 2010). One could argue that a range of boundary conditions could determine whether knowledge or control deficits take precedence in the effects of trust. For example, there might be a higher-order moderation by the description-experience framework (Hertwig & Erev, 2009; Hertwig & Wulff, 2022; Slovic, 1987). Specifically, domains that involve frequent experiential exposure to a threat could amplify the moderating role of personal control. Other domains that involve more frequent exposure to descriptive rather than experiential information could give precedence to a moderation by subjective knowledge in the effect of trust. Moreover, the roles of knowledge and control deficits in the effects of trust could have changed due to societal shifts (Muthukrishna et al., 2021; Pauer, Linne, et al., 2024), for example, the rise of the internet could lead individuals to search online instead of relying on trust cues.

Additional boundary conditions of the interaction effects of trust with subjective knowledge and control perceptions could also concern differences between trustees. For

instance, a moderation effect of subjective knowledge could be more pronounced than a moderation effect of personal control for trust in experts who are not responsible for managing a threat 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 subjective knowledge. Such a pattern of findings would expand on Siegrist (2021)'s suggestion that a moderation of the trust-risk association by subjective knowledge holds for trust in authorities, the industry, and experts alike.

Surprisingly, unlike previous research (Siegrist & Cvetkovich, 2000), our data yielded no interaction between subjective knowledge and trust in authorities. One limitation of Study 2 and 3 is, however, that they lacked measures of risk perception that would be required for a closer conceptual replication of Siegrist and Cvetkovich (2000). Instead, these studies focused on threat perceptions that go beyond risk perception. Additionally, Siegrist and Cvetkovich (2000) did not employ the domains of covid, climate change, and meat consumption in their study. Perhaps more importantly, however, our studies employed only a single domain each, whereas Siegrist and Cvetkovich (2000) tested their model across a total of 25 domains. As such, our studies are considerably dissimilar conceptual replications of their study, indicating a need for future research to employ conclusive replication methods to verify the fundamental model of a moderation by subjective knowledge.

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 threat perception. However, they provide only tentative insights into the more specific motivational and cognitive foundations of personal control that underlie its interaction with trust. While we aimed to provide evidence for a role of control perception broadly construed, a promising avenue for follow-up research is to compare potentially varying effect sizes of distinct facets of control like behavioral control, control over domain-specific outcomes, collective control, and domain-general control (Hamann et al., 2023; Meijers et al., 2022; Nordgren et al., 2007; Rutjens et al., 2010; Skinner, 1996). In doing so, one could further investigate which cognitive antecedents and motivational consequences of personal control influence its moderating role and whether trust in powerful others affords individuals to gain a sense of control (Greenaway et al., 2015; Hornsey et al., 2015).

A limitation of our data is the absence of experimental tests for causal inferences (Bullock et al., 2010; Siegrist, 2021), such as manipulating control and trust perceptions (e.g., Rutjens et al., 2010; Schilke et al., 2015). As the variables employed in our model may be interrelated in several ways, our mediation models provide limited insights into causal pathways, such that competing models might also have played a role (Bullock et al., 2010; Fiedler et al., 2018). In line with best practice advice (Rohrer, 2018), the findings remained significant above and beyond several potentially alternative variables involved, like subjective knowledge, the affect heuristic, responsibility attributions, and political orientation. However, there might be numerous other variables that could play a role. And while the findings are consistent across three studies, particularly Study 2 and 3 might involve alpha error accumulation due to multiple testing, given the large number of variables in our analyses. 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). For instance, Study 1 and Study 2 assessed self-report measures of retrospective behavior, which can involve biased recall, for example (Schwarz, 1999). Although self-reports are often predictive of actual behavior (Kormos & Gifford, 2014), future research should run longitudinal and experimental field studies and investigate behavior change (e.g., Buttlar, Pauer, Ruby, & Scherrer, 2024; Finkhäuser et al., 2024; Hofmann & Grigoryan, 2023). While these considerations limit the conclusiveness of our studies, we consistently observed the detrimental conditional indirect effect of trust on behavioral and attitudinal variables at low levels of personal control across three studies and a total of five behavioral outcomes, justifying the following considerations for communicating about threats.

Crucially, powerful actors such as governmental bodies responsible for managing threats may potentially generate illusory perceptions of secondary control. This may decrease perceived threat in individuals who lack personal control and, consequently, absolve them from accepting necessary individual-level behavior change and system-level policies. These findings illuminate previous research on detrimental effects of trust (e.g., Cruwys et al., 2021; Meijers & Rutjens, 2014) by indicating a moderating role of personal control in these detrimental effects. And our model could inform campaigns that utilize trust for interventions aimed at mitigating societal problems (e.g., Brick et al., 2021; Gainsburg et al., 2023). Especially transparent and empowering communication that fosters personal control in individuals could potentially prevent the detrimental effect of trust. Exploring such communication strategies may become increasingly important in the Anthropocene as human well-being hinges on experts and governmental bodies steering collective action and resolving unprecedented threats.