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DISTANCE MAKES THE MIND GROW BROADER: AN OVERVIEW OF PSYCHOLOGICAL DISTANCE STUDIES IN THE ENVIRONMENTAL AND HEALTH DOMAINS

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Abstract: *Environmental and health issues are two of the most pressing issues society faces today. People often view both environmental and health issues as psychologically distant: they believe that the problems will occur in the future, to other people, in other places and that the exact outcomes are uncertain. This paper provides an overview of studies that have investigated how the different psychological distance dimensions (viz., temporal, spatial, social and hypothetical) influence perceptions, intentions, and decision making in the environmental and health domains. This overview suggests that psychological distance indeed matters in both domains. There are indications that threat perceptions are mostly heightened when communicated or perceived as being psychologically close. However, the studies also show that a mere increase in perceived threat does not necessarily alter intentions or behavior. Moreover, with regard to the effects of psychological distance, there are neither clear differences between the environmental and the health domain nor between the four psychological distance dimensions. We discuss possible moderators that may explain the range of findings. Finally, we conclude with discussing the current stance of the literature and discuss specific research topics that are yet to be studied. As environmental and health behavior involve more than just one decision or one behavior, we suggest, for example, that future studies should investigate how psychological distance influences not only the target behavior, but related behavior as well.*

Keywords: *psychological distance, environment, health, Construal Level Theory*

Environmental and health problems are currently two of the most important global problems. Despite the severity of these problems, people often fail to act in ways that help to conserve the environment or promote their own health. Part of this failure can be ascribed to people's tendency to perceive environmental and health problems as distant in terms of time, space, social distance and hypotheticality (e.g., Carmi & Kimhi, 2015). For example, people think that sea level rise will lead to problems in the distant future, that it will happen elsewhere on the planet, that it will mainly affect other people, and that the outcomes are quite uncertain. This tendency also exists for health issues (e.g., perceptions of disease threats). As such, in the case of an epidemic disease, people have the tendency to believe that it will only happen in the future, that it is more likely to occur in other geographical areas, to other people, and, finally, that it is rather uncertain whether it will happen at all.

Within Construal Level Theory these different distance dimensions are referred to as psychological distance. According to Construal Level Theory (Liberman & Trope, 1998; Trope & Liberman, 2003) people think at higher levels of construal when the psychological distance is larger. This means that distant problems are considered at a more abstract level, whereas proximate problems are considered at a more concrete level. In other words, when thinking about what to do today, this will be far more concrete and detail-enriched as compared to thinking about the same behavior a year from now, which will focus more on the abstract, general features of the behavior. Importantly, it is likely that viewing a problem in either abstract or concrete terms results in different feelings of urgency, motivations and preferences for solutions. As a consequence, people's response to environmental and health-related issues may vary based on their perception of the problem in terms of psychological distance.

The fact that people may respond differently when problems are represented as being either psychologically close or distant is of importance when trying to stimulate pro-environmental or healthy behavior. Therefore, the aim of this paper is to provide a comprehensive (yet not exhaustive) overview of studies that have specifically examined the four psychological distance dimensions in relation to perceptions, intentions and behavior in the environmental and health domains. We discuss the similarities and differences between these two domains and elaborate upon situations in which smaller or larger psychological distance is beneficial in stimulating pro-environmental or healthy behavior. As a result of this overview, we are able to identify a number of gaps in the literature and accordingly provide recommendations for future research. In addition, we provide suggestions for how research in the environmental and health domains can benefit from one another. We end with a discussion in which we elaborate on theoretical implications, methodological issues and practical implications.

Psychological Distance and Construal Level Theory

Construal Level Theory posits that the same action or event can be represented at different levels of abstraction (Liberman & Trope, 1998; Trope & Liberman, 2003; see also Vallacher & Wegner, 1987). A high-level construal consists of an abstract representation of an action, whereas a low-level construal consists of a concrete representation of the same action. For example, recycling paper waste can be represented abstractly as preserving the environment, but also concretely as throwing paper in the recycling bin. Thus a high-level construal focuses on the reason for performing a behavior (e.g., you are recycling paper waste, because you want to preserve the environment), whereas a low-level construal focuses on the way of performing that behavior (e.g., you are recycling by means of throwing the paper in the recycling bin). These levels of construal are most commonly distinguished as being either abstract or concrete, but there are many additional aspects on which high-level and low-level construals can be distinguished. Particularly, high-level construals correspond with simple, decontextualized, superordinate and primary features of events, whereas low-level construals correspond with complex, contextualized, subordinate and secondary features of events (Trope & Liberman, 2003).

According to Construal Level Theory, the level at which a situation will be represented can be determined by its perceived psychological distance (Trope & Liberman, 2003). For example, temporally distant events are likely to elicit abstract, high-level construals, whereas temporally close events are likely to elicit concrete, low-level construals. Next to temporal distance, spatial, social and hypothetical distance can be distinguished. Psychological distance across these four dimensions refers to when, where, to whom and whether an event occurs (Trope & Liberman, 2010). Temporal distance refers to the distance in time between the self and a situation (e.g., an event that takes place tomorrow versus an event that takes place in ten years). Spatial distance (or geographical distance) refers to the distance in space or location between the self and a situation (e.g., an event in one's city versus an event in another city). Social distance refers to the interpersonal distance between the self and others (e.g., an action with consequences for oneself versus an action with consequences for someone else). Hypothetical distance (or probability distance) refers to the distance in hypotheticality between the self and a situation (e.g., an event that certainly will happen versus an event that may possibly take place). However, there are multiple ways in which each of these distance dimensions can be defined and operationalized.

It is possible to manipulate psychological distance by highlighting either the close or distant aspects of certain situations, objects or events. This, in turn, influences the level of construal at which people construe these situations, objects or events. Alternatively, construal level can be manipulated directly. Examples of these manipulations are completing a thought exercise on why versus how one would engage in a certain action (Freitas, Gollwitzer, & Trope, 2004), generating superordinate categories versus subordinate examples (Fujita, Trope, Liberman, & Levin-Sagi, 2006), reading abstract versus concrete vignettes (Fujita et al., 2006), processing information globally versus locally (Wakslak & Trope, 2009), and imagining situations from a third-person perspective versus from a first-person perspective (Libby, Shaeffer, & Eibach, 2009). Such manipulations of construal level have also been studied in direct relation to environmental and health behavior. For example, studies on charitable donations to environmental causes (Obradovich & Guenther, 2016; Rabinovich, Morton, Postmes, & Verplanken, 2009) in the environmental domain and studies on exercising behavior (Sweeney & Freitas, 2014), smoking behavior (Chiou, Wu, & Chang, 2013), eating behavior and weight loss (Chang & Chiou, 2015; Park & Hedgcock, 2016; vanDellen, Sanders, & Fitzsimons, 2012) in the health domain. Generally, these studies seem to suggest that high-level construals work better in stimulating environmentally-friendly and healthy behavior. To further our understanding of Construal Level Theory we discuss studies that have specifically manipulated one of the psychological distance dimensions.

Psychological Distance in the Environmental and Health Domains

How environmental and health problems are perceived in terms of psychological distance and the associated level of construal, can greatly affect perceptions, intentions and behavior. Specifically, for both the environmental and the health domain, psychological distance plays a role in how people perceive and deal with risks, how they process information and how psychological distance ultimately influences their behavior. Notwithstanding the similarities between the domains, it is important to note that there are some distinctive differences in the way that research has been conducted in both domains. In the environmental domain, climate change in particular has gained a lot of attention in recent years, and quite some research has focused on the perception of climate change in terms of psychological distance. In contrast, the health domain has not focused on one main topic, but has rather studied psychological distance in relation to a variety of choices and behaviors. It should, therefore, be noted that these domain-specific differences in methodological approaches are also represented in the content and structure of the sections on the environmental domain on the one hand and the sections on the health domain on the other hand. Each section describes research on one of the four psychological distance dimensions in reference to the environmental and health domains and concludes with a short paragraph that combines the findings from both domains (for an overview, see Table 1).

Temporal Distance

Environment. Although climate change has received increasing interest over the past few years, it is often still perceived as an issue that is distant in time (Carmi & Kimhi, 2015). This is mostly due to the fact that climate change has long-lasting consequences and occurs slowly (Gifford et al., 2009). This makes climate change and most other environmental issues rather abstract concepts, as the consequences of current behavior are only noticeable in the future. Additionally, people have a tendency to believe that climate change consequences will actually get worse in the future (Gifford et al., 2009; Milfont, Abrahamse, & McCarthy, 2011). This suggests that people think that current climate change consequences are not as bad now as they will be in the future and this may affect their current intentions and behavior.

As people have a tendency to perceive environmental problems as temporally distant, some researchers have argued that climate change should be communicated as a present risk (van der Linden, Maibach, & Leiserowitz, 2015). This way people will feel that environmental problems are closer and may therefore increase their feelings of urgency to act. In an experiment, Bashir, Wilson, Lockwood, Chasteen, and Alisat (2014) manipulated subjective temporal distance in terms of climate change consequences by making people place a dot that represented 2020 on a timeline. In the temporally close condition participants were asked to place this dot on a timeline that ranged from now (i.e., 2010) until 2085 and in the temporally distant condition on a timeline that ranged from now until 2025. This manipulation made the year 2020 appear close in the first case and more distant in the latter case. Bashir et al. (2014) found that making future consequences of climate change feel more proximal led to more pro-environmental motivation and behavior in the following week. Participants construed climate change consequences more concretely in the temporally close condition and were therefore more willing to act in the present. In contrast, Goldsmith, Newman, and Dhar (2016) found that participants in the large temporal distance condition (viz., describing their life 'one year from now') were more willing to consider using an eco-friendly product (e.g., a household cleaner) as compared to participants in the small temporal distance condition (viz., describing their life 'tomorrow'). Moreover, participants who were asked to think about their life 'one year from now' (large temporal distance) increased their willingness to consider using an eco-friendly product significantly more when self-transcendent benefits, as compared to economic benefits, were highlighted at the same time. This study shows that other factors may interact with the level of construal. Likewise, a number of studies (e.g., Chang, Zhang, & Xie, 2015; White, MacDonnell, & Dahl, 2011) have examined the effectiveness of loss and gain messages and suggest that temporal distance can function as a moderator. More specifically, they found that proximal messages in combination with loss frames and distal messages in combination with gain frames increased recycling and purchase intentions.

These contrasting findings show that proximizing environmental issues does not always lead to positive effects. Brügger, Dessay, Devine-Write, Morton, and Pidgeon (2015) argue that three possible mechanisms may negate the positive effects of communicating climate change risks as temporally close. First of all, when environmental problems are communicated in a proximal manner, situational factors become imperative and personal values have less of an influence on actual behavior. Alternatively, when people view environmental problems in a temporally distant fashion they will think at a higher level of construal and their behavior will be guided by their personal values. When people value the environment, portraying an issue as being temporally distant may therefore be beneficial in motivating people to act in line with these values. Secondly, the proximate risks of climate change should mean something to individuals to be effective. As such, only when people care about a certain issue that is temporally close, the posed risks may motivate them to take action. Thirdly, even if these proximal risks mean something to individuals, people will only act upon the presented risks when they feel that their actions are effective, feasible and acceptable. Alternatively, when people think at a high level of construal, they may be less affected by these situational considerations and focus more on the ultimate outcome (e.g., Fujita, Eyal, Chaiken, Trope, & Liberman, 2008).

Another factor that may influence the effectiveness of presenting environmental problems as temporally close or distant are individual differences. Tangari and Smith (2012) found that future-oriented consumers evaluate energy efficient products more positively when the savings of such products were presented in the distant future instead of the near future, whereas framing savings as temporally close or distant did not affect present-oriented consumers. In another study, Tangari, Burton, and Smith (2015) investigated the effect of consumer's propensity to elaborate on potential outcomes of their product choices. Tangari et al. (2015) found that participants lower in elaboration were more likely to choose an energy efficient product when the monetary benefits were framed in a temporally proximal manner as compared to a temporally distant manner, whereas distance had less of an effect on participants high in elaboration of outcomes.

Health. Studies on temporal distance in the health domain can be divided into studies that have focused on the relation between temporal distance and risk perception and its subsequent influence on behavior, and studies that investigated how temporal distance directly affects health intentions and decisions. In a study on risk perception, White, Johnson, and Kwan (2014) manipulated the year in which a virus was discovered and asked participants to judge how dangerous the virus is as well as how much they would be willing to pay for a vaccine for that virus. They found that viruses described as originating in recent years (e.g., the year in which the study took place) were perceived as more dangerous than viruses described as originating in distant years (e.g., 25 years ago). In addition, willingness to pay for a vaccine was higher for recently discovered viruses than for earlier discovered viruses. Similarly, an intervention which led to a decrease in perceived temporal distance increased the perceived threat of the risks of soft drink consumption and consequently resulted in lower soft drink consumption one week after the intervention (Ahn, 2015). Another study (Yan & Sengupta, 2013) investigated whether people rely on base rates (i.e., the prevalence of a disease) or case information (i.e., engagement in risky behavior, illness symptoms) when they make health risk assessments for the present or the future. The authors of this study argue that base rates provide abstract information and will therefore be used in psychologically distant situations, whereas case information is concrete and will therefore be used in psychologically close situations. Students were asked to indicate their vulnerability to osteoporosis either now (i.e., temporally close) or when they would be in their sixties (i.e., temporally distant). As expected, participants used case information when assessing their current health risk, but they used base rates when assessing their future health risk. This suggests that different types of information have to be used when persuading people to engage in preventive behavior. All in all, temporal closeness increases perceived health risks, which subsequently has effects on intentions and (preventive) behavior.

Temporal distance also has a direct influence on health intentions and decisions. For example, people have stronger intentions to donate blood in the distant future than in the near future (Choi, Park, & Oh, 2012). When people consider donating blood in the distant future, desirability probably becomes more important, which in turn increases the intention to donate blood. In contrast, when people consider donating blood in the near future, feasibility may become more important, which in turn decreases the intention to donate blood. Temporal distance has a similar effect on food choice. In a study by Laran (2010), participants were asked to make food choices for themselves or for others. It was found that choices for someone else for the future are healthier than choices for someone else for the present, which is comparable to the way in which people make intertemporal choices for themselves. However, people sometimes act rather inconsistently when making intertemporal decisions. More specifically, people often intend to make healthy choices in the future, but at the actual time of decision, the temporal distance has become small and, despite their earlier intentions, many people will switch to unhealthy alternatives (Read & van Leeuwen, 1998). In contrast, sometimes people choose consistently over time (van Beek, Handgraaf, & Antonides, 2016). This consistency (instead of variation over time) might be due to strong pre-existing individual preferences (i.e., choosing a preferred product regardless of when the choice is made), the experimental setting (i.e., being aware that one's choices are being monitored) or the identical choice presentation at both time points (i.e., excluding unintended effects of choosing in different ways at both time points). Although people may choose consistently over time in some situations, people may still want to guard themselves from possible inconsistent choices over time. In those situations, people can make pre-commitments to prevent themselves from making unhealthy decisions later in time. Trope and Fishbach (2000) investigated whether people would be willing to make such a pre-commitment and showed that people actually indicated that they would pay higher fees if they were to cancel an unpleasant but beneficial medical screening examination later in time.

Environment vs. health. The assumption that portraying issues as temporally close is beneficial has been met in studies on pro-environmental behavior (Bashir et al., 2014) and health risk perceptions (e.g., Ahn, 2015; White et al., 2014), but the generalizability of these findings should be treated with some caution. First of all, the processes underlying the way in which people make decisions when a problem is framed in a temporally close manner should be considered. As such, when problems are framed in a temporally close manner, situational cues become more important which can potentially be either inhibiting or promoting the desired behavior. Secondly, individual differences may account for how people attend to certain information. For example, communicating temporally distant benefits of pro-environmental behavior may be very effective for people who are future-oriented, but not so much for people who are present-oriented (Tangari & Smith, 2012). Thirdly, the framing of messages may also influence whether small or large temporal distance is more effective (e.g., White et al., 2011). In contrast to studies showing that smaller temporal distance is beneficial, it has also been found that larger temporal distance increased willingness to consider using eco-friendly products (Goldsmith et al., 2016) and has led to healthier choices in intertemporal decision making (Read & van Leeuwen, 1998). In the latter case, the fact that temporal distance is always very small when making an actual decision calls for different strategies to combat possible inconsistencies in intertemporal choice, by, for example, asking people to make pre-commitments (Trope & Fishbach, 2000).

Spatial Distance

Environment. Spatial distance in the environmental domain often refers to whether people think that environmental threats will affect them locally or whether environmental threats are more likely to hit other geographical areas. People have the tendency to think that the severity of environmental problems is lower in their local area, which has also been referred to as a place-serving bias (Schultz et al., 2014). This may result in people underestimating the environmental threats that may affect their local area and they may thus not take the according actions. Other environmental threats, however, are already experienced on a daily basis, such as pollution in big cities (e.g., in Beijing) and are thus spatially closer. Nonetheless, people often do not attribute environmental degradation to their individual behavior and may therefore still lack the motivation to take the appropriate action (Kollmuss & Agyeman, 2002).

Although most environmental problems seem to be perceived as spatially distant, framing messages as either spatially proximal or distant can influence behavior. Scannell and Gifford (2013) found that local messages resulted in greater climate change engagement than not receiving a message at all, whereas climate change engagement did not differ among those who had received global messages or no message at all. The authors argue that locality may improve people's receptiveness to certain messaging and was therefore more effective in stimulating behavior change. Brügger, Morton, and Dessai (2015) argue that the effect of spatial distance on climate change may depend on what type of action is needed. They found that portraying climate change as a proximal threat (in terms of space) might be effective in promoting individual action, whereas highlighting the distant threats of climate change may be more suited in gaining support for public policy. As such, when people think at a low level of construal they place more value on the details of the specific situation and when this specific situation motivates people to take action this is beneficial. However, low level of construal thinking has also been linked to feasibility concerns (Fujita et al., 2008), which may also make people place more value on potential barriers or other feasibility concerns.

Therefore, proximal messages will not always be more effective, but it may simply relate to how people process information. In a study by Hodges (2014) participants were asked to evaluate projects that were closely located or projects that were located further away (i.e., offshore drilling). In line with Construal Level Theory, the more proximate project was evaluated more concretely and people based their evaluations on the specific, detailed information provided about this project. Support for the more distant project, however, relied on participant's underlying values and not on the provided information. This shows that people process information differently when thinking of either spatially proximal or distant objects. As such, when thinking of a project located far away, values are more indicative for the evaluations, and evaluations of the closely located project are based on the low level, detailed information provided about the project. Other studies show that both high and low level of construal approaches may actually result in a similar outcome, irrespective of whether the context or one's underlying values guide behavior. For example, Spence and Pidgeon (2010) framed sea level rise messages as being either spatially close (i.e., in Cardiff) or spatially distant (i.e., in Rome) and did not find any significant differences in terms of people's attitudes toward climate change mitigation. The authors speculate that people may actually feel too optimistic about the local impacts of climate change, and distant messages do not result in action as these issues may seem too far removed from their personal situation.

Finally, individual differences may also affect how people attend to information that is portrayed as being either proximal or distant in terms of space. Schoenefeld and McCauley (2015) examined the role of self-enhancement and self-transcendent values in relation to communicating the local or global impacts of climate change. Specifically, they looked at the effects on individuals' perception of the importance of climate change as well as their willingness to take action. They found that participants who scored high on self-transcendent values were in general more willing to engage in pro-environmental actions across all information conditions. In contrast, a reactance effect was found for participants who scored high on self-enhancement values. This reactance effect indicated that local information made these participants view climate change as less important and they were less willing to take action as compared to participants receiving no information or global information. The authors thus suggest that policy makers should be aware of the possible negative effects of communicating the local impacts of climate change.

Health. In the health domain, studies on spatial distance have involved geographical distance as well as actual physical distance (e.g., being 40 vs. 100 cm removed from an object). In a study on disease threat perception, it was hypothesized that spatial distance would be directly related to the threat that a virus causes, because the risk of infection increases as the spatial distance between oneself and the virus decreases. White et al. (2014) manipulated the location where a virus was discovered (e.g., a city close by or far away) and found that participants judged spatially close viruses as more dangerous than spatially distant viruses. Additionally, participants were willing to pay more for vaccines for spatially close viruses than for spatially distant viruses. In a study on food labelling, spatial distance was manipulated by informing participants that food products had either a local origin (i.e., spatially close) or a non-local origin (i.e., spatially distant; Merle, Herault-Fournier, & Werle, 2016). Again, a local label increased the perceived benefits of the food products for oneself (e.g., health, taste) and for others (e.g., environmental benefits) and in addition had a positive effect on purchase intentions. In another study, participants preferred larger assortments for close locations (e.g., an ice cream shop in one's city), but smaller assortments for distant locations (e.g., an ice cream shop in another city; Goodman & Malkoc, 2012). In a psychologically distant situation options seem more substitutable than in a psychologically close situation, which in turn leads to a decrease in preference for large assortments. These findings would imply, given the positive relation between assortment size and healthiness of choices (i.e., people make healthier choices from larger assortments; Sela, Berger, & Liu, 2009), that people make healthier choices for close locations than for distant locations. Taken together, these studies all suggest that spatial closeness increases perceived health risks and motivates people to make healthier choices.

Spatial distance can also be operationalized as the distance between an object and oneself (Maas, de Ridder, de Vet, & de Wit, 2012). In two studies snacks were placed at various distances from individuals (i.e., 20, 70 or 140 cm) and it was investigated whether this influenced consumption of snacks. It was found that the probability of snack intake as well as the amount of snack intake was lower in the two distant conditions than in the close condition. No significant differences in snack intake were found between the two distant conditions. These results suggest that when unhealthy food products are less accessible, because they are placed further away, it is less likely that people will consume them. However, it should be noted that perceived effort was higher when snacks were placed further away from the individual (although the design of the study did not allow for investigating the mediational role of perceived effort), whereas perceived salience did not vary across the three distance conditions. These results seem to be in contrast with previous studies, because spatial closeness leads to unhealthier (instead of healthier) choices. However, if these results would be generalizable to healthy food products, they would be in line with previous studies. If people would also eat more from healthy food products that are placed close by than from healthy food products that are placed further away, it would still be the case that spatial closeness leads to healthier choices.

Environment vs. health. In terms of spatial distance, research seems to suggest that smaller distance is more beneficial in terms of climate change engagement (Scannell & Gifford, 2013), disease threat perception (White et al., 2014) and food choice (Merle et al., 2016). Potentially, this can be due to an appropriate risk assessment; when spatial distance is small, environmental or health threats may be more likely to occur in one's own geographical area and this may duly increase feelings of urgency to take action. In contrast to studies showing positive effects of small spatial distance, receiving policy support in the environmental domain seems to increase when messages appeal to the more global nature of climate change (Brügger et al., 2015). Interestingly, some studies also found that messages that appealed to either the local or global impacts of climate change resulted in similar outcomes, but found that people processed the information differently (e.g., Hodges, 2014). The way people process information may be the most important factor in determining intentions and behavior. As such, situational factors become imperative in spatially close situations, which is only beneficial when the context promotes environmentally-friendly or healthy behavior.

Social Distance

Environment. On the social dimension, climate change and environmental threats are often viewed as distant, which means that people think that environmental problems are more likely to affect others (Carmi & Kimhi, 2015). This larger distance on the social dimension is sometimes referred to as the optimism bias (Gifford et al., 2009), as people feel more optimistic about their own situation than about the situation of others. The optimism bias may lead to inappropriate risk assessments, as people may feel too optimistic about their own situation and this may in turn inhibit taking the appropriate action. Therefore, some researchers (e.g., van der Linden et al., 2015) have argued that environmental risks should be communicated as a personal risk to stimulate people to change their behavior.

The drawback of communicating environmental problems as a personal risk is that people may feel overwhelmed, become defensive and are actually not willing to take action (Brügger et al., 2015; Pahl, Sheppard, Boomsma, & Groves, 2014). Highlighting the benefits to others or society at large may be a suitable alternative to motivate people to take action. In an experiment on green purchase intentions, highlighting the benefits to others increased the willingness to purchase green products when abstract appeals were used at the same time (Yang, Lu, Zhu, & Su, 2015). In that same study, however, concrete and abstract appeals did not lead to different purchase intentions when benefits to self were highlighted.

Besides highlighting the benefits to self or to others, social distance can also be operationalized as appealing to either the effects on an individual (small social distance) or on a group as a whole (large social distance; Malkoc, Zauberman, & Bettman, 2010). The distinction between the effects of behavior on an individual versus a group (or others) has been linked to self-enhancement and self-transcendent values (Schwartz, 1992). Previous studies (e.g., Bolderdijk, Steg, Geller, Lehman, & Postmes, 2013; Schwartz, Bruine de Bruin, Fischhoff, & Lave, 2015) have shown that self-transcendent appeals (e.g., appealing to the environmental benefits of behavior) work better in stimulating pro-environmental behavior than self-enhancement appeals (e.g., appealing to the financial benefits of behavior). Additionally, Goldsmith et al. (2016) found that participants' willingness to consider using an eco-friendly product was highest when self-transcendent benefits were highlighted, but only when participants were in the abstract mindset condition. Even among climate change deniers, larger social distance (viz., when their behavior was presented in a way that it would benefit others) increased their willingness to act pro-environmentally (Bain, Hornsey, Bongiorno, & Jeffries, 2012). Another way in which social distance can be operationalized is by asking people to make choices either for themselves or for others. Attari (2014) asked participants for the most effective strategy to conserve water, either for themselves or for other Americans. Interestingly, participants usually chose the less effective (curtailment) strategies for themselves and the more effective (investment) strategies for others. Taken together, these findings suggest that larger social distance may be more beneficial in stimulating environmentally-friendly actions.

As noted before, the way psychological distance affects actual behavior may also depend on individual differences. Hart and Nisbet (2011) found that Democrats increased support for climate change mitigation, irrespective of whether it was presented with high or low social distance cues. For Republicans, however, low social distance cues did not affect policy support, whereas high social distance cues actually decreased Republicans' support for climate mitigation policy.

Health. Studies on social distance in the health domain can be divided into studies on risk perception and its subsequent effects on intentions and behavior, and studies on interpersonal decision making. White et al. (2014) manipulated virus names such that they referred to either socially close targets (i.e., humans) or socially distant targets (i.e., animals), even though all viruses only affected humans. This subtle manipulation of social distance resulted in differences in threat perception. Viruses with names referring to humans (e.g., Human Enterovirus) were perceived as more dangerous than viruses with names referring to animals (e.g., Nairobi Sheep Disease). Again, participants were willing to pay more for vaccines and treatments for a socially close virus than for a socially distant virus. Another study on risk perception investigated whether people use different types of information when they make health risk assessments for themselves or for others (Yan & Sengupta, 2013). In several studies it was found that people rely on (abstract) base rates when assessing health risks for others, but use (concrete) case information when assessing their own health risks. Finally, one study investigated whether tailoring messages to the self (vs. other) is effective in order to reduce soft drink consumption (Ahn, 2015). It was found that decreasing social distance (by means of tailoring messages to the self) increased the personal relevance of the risks of soft drink consumption and consequently reduced intentions to consume soft drinks.

Studies on social distance in the health domain have also compared making food choices or medical decisions for oneself versus for someone else. For example, Laran (2010) found that food choices for others are more indulgent than food choices for oneself. This could be due to the lack of a self-control conflict when choosing for others. While individuals experience this conflict when choosing for themselves and consequently make both healthy and indulgent choices, they do not experience this conflict when choosing for others and simply make indulgent choices. With respect to medical decision making, it was found that medical decisions for others are more future-focused, whereas medical decisions for oneself are more present-focused (Peng, He, Zhang, Liu, Miao, & Xiao, 2013). The results of these studies seem to be in contrast with each other, which could probably be due to the different subdomains (food and medicine) that the studies were conducted in.

Environment vs. health. The fact that people have the tendency to be more optimistic about their own situation than about the situation of others (Gifford et al., 2009) may suggest that a smaller social distance is beneficial in stimulating pro-environmental and healthy behavior. This premise seems to hold in the health domain, as smaller social distance actually increased disease threat perception (White et al., 2014), reduced intentions to consume soft drinks (Ahn, 2015) and led to healthier food choices (Laran, 2010). In the environmental domain, smaller social distance was not necessarily more beneficial, although larger social distance did prove to have negative effects among Republicans in terms of policy support (Hart & Nisbet, 2011). Apart from this study, in the environmental domain it seems that portraying problems as more socially distant, as affecting either other people, society at large or the environment, is more effective than appealing to the self-relevant benefits of pro-environmental behavior. In the health domain, greater social distance only had a positive effect on medical decision making, as health decisions for others were found to be more future-oriented (Peng et al., 2013). The way in which social distance is manipulated in both domains is rather different, which may account for the contrasting effects. In the environmental domain, social distance mostly pertains to messages that highlight benefits to the self or to others, whereas in the health domain many studies focus on making decisions either for oneself or for someone else.

Hypothetical Distance

Environment. Similar to the other psychological distance dimensions, people often view climate change and other environmental problems as hypothetically distant (Carmi & Kimhi, 2015). This means that people perceive either the outcomes of environmental threats as uncertain or the timing of those outcomes as uncertain (McDonald, Chai, & Newell, 2015). In a survey study by Spence, Poortinga, and Pidgeon (2012) participants indicated that they were rather certain that climate change is happening, but that they are less certain about what the exact impact will be and how severe the problem actually is.

Ballard and Lewandowsky (2015) investigated how people respond to messages that highlight the uncertainty related to either the timing of the outcomes or the severity of the outcomes. They found that people who were in the time uncertain condition perceived the risk as more serious and were more likely to take action as compared to participants in the outcome uncertain condition. In other words, when people believe that climate change will happen and has some negative outcomes, but are uncertain of when it will actually happen, they will likely take some action. However, when people believe that the consequences of climate change are uncertain, for example fueled by the perceived disagreement between climate scientists, they are less likely to take action (Ding, Maibach, Zhao, Roser-Renouf, & Leiserowitz, 2011; Lewandowsky, Gignac, & Vaughan, 2013). The effect of higher uncertainty in relation to individual action may be overcome when these uncertainties are framed either positively or negatively. In a study by Morton, Rabinovich, Marshall, and Bretschneider (2011) it was found that when climate change outcomes were presented as being highly uncertain, positive framing led to higher willingness to act as compared to negative framing. In the low uncertainty condition, framing the effects of climate change either positively or negatively did not have an effect. This, again, shows that the way information is presented to people plays a major role in their willingness to act upon that information.

Moreover, there are a number of factors that complicate matters with the mere perception of uncertainty or risks related to climate change and environmental degradation. First of all, people often have difficulties with understanding climate change predictions or probabilities (Budescu, Por, & Broomell, 2012). The fact that people cannot fully grasp the implications from the predictions and probabilities may cause people to do nothing. Secondly, people have a tendency to selectively include information that is in line with their values in terms of expert communications about climate change risks. Kahan, Jenkins-Smith, and Braman (2011) assessed how "hierarchical individualists" and "egalitarian communitarians" evaluate expert opinions that indicate that climate change is either a high risk or a low risk. Specifically, they asked participants to state to what extent they thought that the author of the risk statement is an expert or not. Interestingly, 89% of the egalitarian communitarians thought the author was expert in the high risk scenario, whereas only

23% of the hierarchical individualists thought the author was expert in the high risk situation. Quite the opposite effect was found in the case the author indicates that climate change poses a low risk, where 86% of the hierarchical individualists believed that the author is an expert, whereas only 51% of the egalitarian communitarians believed that the author is expert. The aforementioned studies suggest that communications or perceptions of uncertainty are influenced by the value orientations of individuals as well as the way the information is presented to them.

Health. A few studies investigated the effect of hypothetical distance on risk perception. White et al. (2014) manipulated hypothetical distance by means of the frequency with which participants encountered the name of a virus. They found that when the name of a virus was encountered more frequently, participants perceived the virus as more dangerous and were willing to pay more for a vaccine than when the name of the virus was encountered less frequently. Another series of studies on health risk perception (Yan & Sengupta, 2013) shows that when base rates are high, but case information signals low risk, people tend to be overly optimistic about their own health risk as compared to others. Even though the hypothetical distance towards the disease is small, people do not think they are at risk. However, when base rates are low, but case information signals high risk, people tend to be overly pessimistic about their own health risk as compared to others. Even though the hypothetical distance towards the disease is large, people do think they are at risk. Together, these studies indicate that there is no straightforward relation between hypothetical distance and risk perception.

Environment vs. health. Considerably less research has been conducted on hypothetical distance as compared to the other distance dimensions in both the environmental and the health domain. As hypothetical distance involves the degree of certainty with which something will happen, it can be operationalized in many different ways. In the environmental domain it seems that when people believe that climate change consequences will affect them, but they are merely uncertain about the timing, they are willing to take action (Ballard & Lewandowsky, 2015). However, when people are uncertain about the actual consequences of climate change they are less willing to take action. In the health domain hypothetical distance has been manipulated by the frequency with which a virus is encountered (White et al., 2014) and by investigating the effects of different combinations of base rates and case information (Yan & Sengupta, 2013). As mentioned before, it is yet unclear whether smaller hypothetical distance and its effect on intentions and behavior is due to an appropriate estimate of risk or due to the level of construal.

General Discussion

In the current paper we have discussed studies that have manipulated psychological distance and measured its subsequent influence on behavior in the environmental and health domains. As can be deduced from the overview in Table 1, the effects of psychological distance on behavior in both the environmental and health domain are rather dispersed. Taken together, the results of the discussed studies suggest that there are interesting similarities between the psychological distance dimensions and between the environmental and health domains. However, some clear differences between the two domains per se are worth noting, because they may account for some of the differential findings.

First of all, environmental and health behavior differ considerably on the social dimension. Most environmental problems affect society as a whole (this is especially true for climate change). For example, when someone decides to act in an environmentally-unfriendly manner, this has some effect on many others, whereas the individual consequences of such behavior are not directly experienced and accounted for by the individual. In terms of health behavior, this is quite different, as people often feel that deciding to act in an unhealthy manner will only affect the person him or herself (later on in time). Clearly, if everyone decides to act in an unhealthy manner this has implications for society (e.g., higher healthcare costs), but compared to environmental decisions, people may feel that health decisions are more personally relevant. Secondly, psychological distance influences the perceptions of problems. Perceptions of urgency, for example, may be influenced by how far away in the future the problem is (perceived to be) located. As argued by Brügger et al. (2015), the perceived distance is only relevant when the posed threat or issue means something to the individual. Therefore, when an issue is not important to an individual at all, the perceived psychological distance will not greatly affect subsequent behavior. The fact that health issues are often perceived as being more personally relevant than environmental issues may explain why smaller psychological distance is sometimes more effective in the health domain. Thirdly, the way psychological distance is manipulated also differs in these domains and may thus account for the differential effects. Clearly some manipulations can be used in both domains (e.g., highlighting benefits now vs. later), whereas other manipulations are harder to operationalize across the domains (e.g., manipulating the physical distance of objects in centimeters). It would be interesting for future research to assess how manipulations from one domain apply to the other domain. For example, it would be interesting in the health domain to apply the hypothetical distance manipulation used in the environmental domain, by manipulating the certainty of timing or certainty of consequences of a particular problem (Ballard & Lewandowsky, 2015).

Perceptions, Intentions and Behavior

Despite the differential effects of psychological distance in the environmental and health domains, the discussed studies show some consistency among findings in relation to perceptions, intentions and behavior across both domains. To start with, in terms of perceived risks or threats of environmental and health issues, it appears that smaller psychological distance increases perceived risks. This is most clearly shown in the health domain by the study of White et al. (2014), showing that smaller psychological distance (across all four dimensions) leads to higher threat perceptions. Unfortunately, in the environmental domain, empirical studies investigating how risk perceptions are influenced by the psychological distance dimensions are scarce. Despite missing empirical findings, many researchers have argued that communicating climate change or other environmental problems as a psychologically close problem will increase their risk perception (see van der Linden et al., 2015). Therefore, future research could specifically study how risk perceptions in the environmental domain are affected when communicating environmental problems as a psychologically close risk.

Most of the discussed studies that have looked at risk perceptions have also measured behavioral intentions (e.g., White et al., 2014) and show that intentions are positively correlated with increased threat perceptions. However, in other studies, when people are specifically asked to express their *intentions* to portray some behavior, it seems that larger psychological distance leads to the environmentally-friendly or healthy option. For example, when people are asked to make food choices that pertain to either now or later on in time, they often choose the healthier alternative later on in time (e.g., Read & van Leeuwen, 1998). In a similar vein, on the social dimension, making choices for others leads to the desirable option in respect to medical decision making (Peng et al., 2013) and green purchase intentions (Yang et al., 2015). However, for *actual behavior* the results might be quite different. For example, although someone indicates that he or she will choose the healthier option later on in time, at the moment when he or she actually has to choose between a healthy and unhealthy food option, the temporal distance has become small and he or she may still opt for the unhealthy alternative. In sum, one should be aware of the fact that increased perceptions of risks or threats may not always translate into intentions, nor will these intentions translate into behavior.

Moderating Factors

One possible explanation for the sometimes different findings with regard to the relationship between psychological distance and intentions and behavior is the existence of systematic moderators of these effects. Especially in the environmental domain, researchers have looked at individual difference factors that may moderate the effect of psychological distance on observed intentions and behavior. In the health domain this has been a less researched avenue, but we expect that the comparable results can be found in the health domain. Clearly, people who are more future-oriented are more susceptible to messages that fit their orientation (e.g., showing that temporally distant messages are more effective for future-oriented people; Tangari & Smith, 2012). Political orientation may also influence how people evaluate different messaging. For example, Hart and Nisbet (2011) found that support for climate change mitigation decreased among Republicans when social distance cues were large, whereas Democrats' support was unaffected by social distance cues. Another individual difference factor of importance seems to be how much people value their self-interest, measured by self-enhancement values, or benefits to others, measured by self-transcendent values. On the spatial distance dimension, people who score high on self-enhancement values were less willing to take action when local information was presented to them as compared to no information at all or global information (Schoenefeld & McCauley, 2015). In contrast, people who scored high on self-transcendent values were more willing to take action in general, irrespective of the type of information they were given. These studies show that psychological distance can have differential effects and even negative effects among some participants.

As suggested, individual differences can largely determine whether people act in an environmentally-friendly or healthy manner. Important to note is that the level of construal also plays a role in whether these individual differences actually matter or not. As such, theory suggests that people act more upon their inner values when they think at a high level of construal (Giacomantonio, De Dreu, Shalvi, Sligte, & Leder, 2010), and thus when the psychological distance is large. Therefore, individual differences may be more pronounced when people think at a high level of construal. To illustrate, this may mean that people who state that they do not care about the environment are more likely to act in line with this value in a psychologically distant scenario, whereas such values are of less importance when the psychological distance is small and people are more influenced by the situation itself (which may actually promote pro-environmental behavior).

Finally, different thought processes underlie people's decisions or behavior when the psychological distance is either small or large. This makes it possible that the decision-outcome or behavior is the same in both the psychologically close and distant situation, but that people come to this decision via different routes (e.g., Spence & Pidgeon, 2010). For example, Yan and Sengupta (2013) showed that people rely on case information in the temporally close situation and on base rate information in the temporally distant situation. Similarly, Hodges (2014) showed that people use detailed project information when evaluating a closely located project and rely more on their values when evaluating a distantly located project. Moreover, the framing of messages may also influence the effectiveness of psychological distance. For example, gain framed messages may work well in combination with large psychological distance, whereas loss framed messages are more effective in combination with small psychological distance (e.g., Chang et al., 2015). Therefore, the underlying decision processes are an important factor to keep in mind when designing intervention programs.

Limitations and Future Research

Most research that has been included in this overview focuses on the effects of psychological distance on specific behaviors, as most studies feature one particular behavioral outcome. However, it is as yet unclear how such interventions affect related behaviors. This so-called 'spillover' is an important issue in both the environmental and health domain, since both environmental and health outcomes in the long term depend on a host of different behaviors. Improving one specific behavior is not useful if it leads to a deterioration in another behavior. For reducing one's environmental impact, for example, taking shorter showers may seem like a great idea, but this effect is largely undone if the money saved by saving energy is subsequently spent on buying an airplane ticket. Moreover, both environmental and health outcomes usually require behavior change over time and in different contexts, for example by changing habits. We consider it likely that a higher level of construal is helpful for positive spillover to occur to related behaviors as well as for sustained behavior change in multiple contexts. As such, research suggests that higher levels of construal can make people view the similarities between a number of behaviors and make them aware of inconsistencies of their own behavior (Trope & Liberman, 2003). For example, research shows that focusing on the environmental benefits of car sharing increased recycling behavior (Evans, Maio, Corner, Hodgetts, Ahmed, & Hahn, 2012). Besides some studies that show positive spillover effects, this hypothesis has not been extensively tested.

Additionally, most research specifically looked at manipulating one psychological distance dimension and its subsequent effect on perceptions, intentions or behavior. With the exception of the work by Laran (2010) and Goldsmith et al. (2016), most studies have not investigated how different psychological distance dimensions interact and affect behavior. From a construal level perspective this is rather interesting, as people usually need a low level of construal component to engage in certain behavior (e.g., knowing how to do something) and a high level of construal component to be motivated to engage in that behavior (e.g., knowing why to do something). According to the Theory of Planned Behavior (Ajzen, 1985), perceived behavioral control or efficacy –which is the extent to which people feel able to implement certain behaviors– is an important predictor of behavioral outcomes. It, therefore, seems that at some point in time behavioral change requires a low level of construal. However, people may also need the high level of construal component to be actually motivated and sustain in performing the behavior. One important question that arises is whether it is possible to simultaneously view a problem from a high and low level of construal. If so, this might allow for motivation and efficacy to be increased at the same time. This was effective in a study by Rabinovich, Morton, Postmes, and Verplanken (2009), as appealing to both a low and high level of construal component increased people's willingness to donate to an environmental organization. However, other research seems to suggest that only one level of construal at a time can be entertained. More specifically, when both lower and higher levels of construal are appealed to, the lower level may crowd out the higher level motivation (Fujita, Clark, & Freitas, 2013). Thus, combining different levels, for example in interventions, may not result in the desired additional effects, but may result in complex interactions between levels. More research is needed to clarify this (see e.g., Griffioen, Handgraaf, & Antonides, 2016).

This review has also revealed methodological issues within research on psychological distance. To begin with, many different manipulations and measurements have been used for psychological distance. It is likely that these different manipulations have slightly different effects on the underlying variables, but as yet it remains unclear how these effects differ. It is, for example, likely that two different manipulations of temporal distance have a slightly differential effect on feelings of urgency. This makes it difficult to compare the results of a study that uses one manipulation to the results of another study using a different manipulation and may partially explain the differential findings. A second methodological issue is the fact that construal level is not only seen as something that can be manipulated (Trope & Liberman, 2003), but also can be seen as a stable individual trait (Vallacher & Wegner, 1989). One question that automatically comes up is whether experimental manipulations of psychological distance and construal level have the same effect on people with high versus low trait construal levels. This is especially important in light of creating successful interventions, where some manipulations may only affect part of the population. However, most studies do not control for the trait-component of construal level and it remains therefore unclear how manipulations of psychological distance play out for people who have different tendencies in terms of construal level.

Practical Implications

Although we are not able to provide general recommendations on whether smaller or larger psychological distance is beneficial for stimulating environmentally-friendly or healthy behavior, this overview does provide policy makers with some tools to make informed decisions on how to design interventions. As stated, environmental and health problems are often perceived as being psychologically distant on all four dimensions (viz., temporal, spatial, social and hypothetical distance). Based on this premise, people may think of these issues in a rather abstract manner, which could be problematic when people actually have to take concrete actions here and now. The acceptance of solutions and the resulting actions people have to implement will be influenced by construal level. More specifically, lower levels of construal are probably associated with more concrete images of actions that can be taken. Such concrete solutions (e.g., take shorter showers) will be more straightforward to implement than high level solutions (e.g., save energy). Besides, whether concrete images are necessary for people to know how they should act in a certain way greatly depends on the type of behavior. It is likely that high level construals lead to consistent behavior over time and across different situations: the motivation to take shorter showers will not be very helpful at work (assuming showering does not occur there), whereas the motivation to save energy can still be implemented there. Knowledge about these effects of psychological distance and construal level are important for policy makers, since this allows them to tailor their interventions to the type of outcomes they want to achieve.

Moreover, knowledge about the effects of psychological distance and construal level will make it easier for policy makers to explain and anticipate the differences between the actions people plan to take and the actions people end up taking. In the health domain, for example, we all know that exercising is a good idea, so we plan to do it more in the future (large psychological distance), only to decide to watch TV when the moment has come to go for a run (small psychological distance). One important question that research on psychological distance may be able to address is how to make these preferences for future behavior materialize in the present. The use of commitment devices where aspirations for the future are transformed into a commitment that is costly to break is such an example (Trope & Fishbach, 2000).

Concluding remarks

Although environmental and health issues are often mentioned as examples when explaining the mechanisms underlying psychological distance and construal level (e.g., Day & Bartels, 2008; Fujita et al., 2008), studies on the four psychological distance dimensions in direct reference to environmental and health behavior are less abundant. In this paper we have discussed studies that have applied the psychological distance dimensions specifically to the environmental and health domains. In general, it seems difficult to draw conclusions about whether smaller or larger psychological distance is beneficial in the environmental and health domains. Besides some straightforward differences between the environmental and health domains, the main differences can be found between studies rather than between domains or between the psychological distance dimensions. We can conclude from the studies in this overview that people usually perceive higher risks when psychological distance is small, but that the effect of psychological distance on actual intentions and behavior is less clear cut. More research into psychological distance as a key determinant of decisions in the environment and health domains promises to yield greater insight into underlying processes and can help people to make better choices.

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Table 1
Overview of the Effects of Psychological Distance in the Environmental and Health Domains.

Psychological distance dimension	Domain	Small distance leads to…	Large distance leads to…
Temporal distance	**Environment**	• Increased pro-environmental motivation and behavior (Bashir et al., 2014) • Increased recycling and purchase intentions in combination with a loss frame (Chang et al., 2015; White et al., 2011) • Increased likelihood to choose energy efficient products among participants who scored lower in elaboration of outcomes (Tangari et al., 2015)	• Increased willingness to consider using eco-friendly products (Goldsmith et al., 2016) • Increased recycling and purchase intentions in combination with a gain frame (Chang et al., 2015; White et al., 2011) • Increased positive ratings of energy efficient products for future-oriented individuals (Tangari & Smith, 2012)
	Health	• Increased perceived disease threat and willingness to pay for a vaccine (White et al., 2014) • Increased perceived threat of the risks of soft drink consumption and decreased soft drink consumption (Ahn, 2015) • Use of case information for the assessment of health risks (Yan & Sengupta, 2013) • Unhealthier food choices (Read & van Leeuwen, 1998)	• Use of base rates for the assessment of health risks (Yan & Sengupta, 2013) • Increased intention to donate blood (Choi et al., 2012) • Less indulgent food choices for someone else (Laran, 2010) • Healthier food choices (Read & van Leeuwen, 1998)
Spatial distance	**Environment**	• Increased climate change engagement (Scannell & Gifford, 2013) • Increased individual action (Brügger et al., 2015) • Use specific, detailed information for evaluation of a project (Hodges, 2014) • A reactance effect for people who scored high on self-enhancement values in terms of willingness to act and perceived importance of climate change (Schoenefeld & McCauley, 2015)	• Increased public policy support (Brügger et al., 2015) • Use of underlying values for evaluation of a project (Hodges, 2014)
	Health	• Increased perceived disease threat and willingness to pay for a vaccine (White et al., 2014) • Increased perceived benefits of healthy food products and increased purchase intentions (Merle et al., 2016) • Increased preference for larger assortments (Goodman & Malkoc, 2012) potentially leading to healthier choices (Sela et al., 2009)	• Increased preference for smaller assortments (Goodman & Malkoc, 2012) potentially leading to unhealthier choices (Sela et al., 2009) • Decreased probability and amount of snack intake (Maas et al., 2012)
Social distance	**Environment**		• Increased green purchase intentions (Yang et al., 2015) • Increased car tire checks (Bolderdijk et al., 2013) • Increased sign-ups for an energy saving program (Schwartz et al., 2015) • Increased willingness to consider an eco-friendly product when in the abstract mindset condition (Goldsmith et al., 2016) • Increased willingness to act pro-environmentally among climate change deniers (Bain et al., 2012) • Increased choices for more effective water conservation strategies (Attari, 2014) • Decreased policy support among Republicans (Hart & Nisbet, 2011)
	Health	• Increased perceived disease threat and willingness to pay for a vaccine and treatment (White et al., 2014) • Use of case information for the assessment of health risks (Yan & Sengupta, 2013) • Increased perceived relevance of the risks of soft drink consumption and decreased soft drink consumption intentions (Ahn, 2015) • Present-focused medical decisions (Peng et al., 2013)	• Use of base rates for the assessment of health risks (Yan & Sengupta, 2013) • More indulgent food choices (Laran, 2010) • Future-focused medical decisions (Peng et al., 2013)
Hypothetical distance	**Environment**		• Increased willingness to act when outcomes were framed positively (Morton et al., 2011) • Increased perceived risk and action when timing of outcomes was uncertain (Ballard & Lewandowsky, 2015) • Decreased willingness to take action when outcomes are uncertain (Ding et al., 2011; Lewandowsky et al., 2013)
	Health	• Increased perceived disease threat and willingness to pay for a vaccine (White et al., 2014) • Underestimation of personal health risks (Yan & Sengupta, 2013)	• Overestimation of personal health risks (Yan & Sengupta, 2013)