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The impact of domain-specific beliefs on decisions and causal judgments

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ABSTRACT

Extensive evidence suggests that people often rely on their causal beliefs in their decisions and causal judgments. To date, however, there is a dearth of research comparing the impact of causal beliefs in different domains. We conducted two experiments to map the influence of domain-specific causal beliefs on the evaluation of empirical evidence when making decisions and subsequent causal judgments. Participants made 120 decisions in a two-alternative forced-choice task, framed in either a medical or a financial domain. Before each decision, participants could actively search for information about the outcome ("occurrence of a disease" or "decrease in a company's share price") on the basis of four cues. To analyze the strength of causal beliefs, we set two cues to have a generative relation to the outcome and two to have a preventive relation to the outcome. To examine the influence of empirical evidence, we manipulated the predictive power (i.e., cue validities) of the cues. Both experiments included a validity switch, where the four selectable cues switched from high to low validity or vice versa. Participants had to make a causal judgment about each cue before and after the validity switch. In the medical domain, participants stuck to the causal information in causal judgments, even when evidence was contradictory, while decisions showed an effect of both empirical and causal information. In contrast, in the financial domain, participants mainly adapted their decisions and judgments to the cue validities. We conclude that the strength of causal beliefs (1) is shaped by the domain, and (2) has a differential influence on the degree to which empirical evidence is taken into account in causal judgments and decision making.

1. Introduction

1.1. The impact of domain-specific beliefs on decisions and causal judgments

Decisions in different domains can promote content-specific rules for information processing. Prominent examples are the cheater-detection mechanism in the domain of social exchange (Cosmides & Tooby, 1989, 1992; Gigerenzer & Hug, 1992), the selection of mating partners (Buss, 1992), adaptive memory for objects relevant for survival (Nairne, Thompson, & Pandeirada, 2007), and the prediction of other people's behavior (Baron-Cohen, 1995). We propose that domain-specific information may affect the strength of people's causal beliefs when making causal judgments and decisions. We focus on two life domains that differ in their typical structure of problems and nature of consequences: the medical and the financial domain. In fact, a recent study suggests that people are more willing to take advice in the medical domain than in the financial domain (Garcia-Retamero & Galesic, 2013). Would these two domains also differ in the way causal beliefs affect judgments and decisions?

In many daily life situations, people rely on their causal beliefs to make decisions. Imagine a medical practitioner who prescribes a specific treatment to a patient under the assumption or the causal belief that the treatment cures a disease. How did this medical practitioner develop this causal belief? While pursuing a medical career, she probably has learned and was examined about which treatment most likely cures the disease. Also the direct experience with patients and their reaction to treatments (e.g., side effects, effectiveness) might have shaped those beliefs. However, would people rely on causal beliefs to the same extent in other domains? Imagine an investor who gambles at the stock market—would she base her decisions on causal assumptions about the stock market or the experience of previous success?

1.2. Domain-specific causal beliefs

There is a fairly developed literature on risk perception and risk taking documenting that people's choices and preferences differ between domains (e.g., Weber, Blais, & Betz, 2002). Consequently, the term "domain independence" (Chapman, 1996) refers to domains, which show rather low correlations—as it has been documented for the health and the monetary domain (Chapman & Elstein, 1995; Hardisty & Weber, 2009). Taking these findings into account, the current study aimed at examining whether the strength of causal beliefs also differs between these decision domains. One dimension that may influence the

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way information is processed in a particular domain is the *temporal variability of cue validities*. We refer to the validity of a cue as the probability that this cue leads to a correct decision, given that this cue discriminates between the alternatives (Gigerenzer, Todd, & the ABC Research Group, 1999). Cue validities resemble the general empirical evidence in the environment. The temporal variability of cue validities can be perceived on a continuum ranging from low to high. Low temporal variability means that the cue validities show little or no change over time. In this case, the strong causal beliefs might be of great benefit to the decision maker, as cues are very likely to remain valid over time. For example, in the health domain, a substance or behavior that was noxious years ago is likely to be still noxious today, because essential physiological processes within the human organism are very unlikely to change over such periods of time. Indeed, people have been shown to persist in very strong causal beliefs in the medical domain, even when contradictory evidence is available (Beyerstein, 1997; Haynes, 2009). In contrast, high temporal variability of cue validities means that there is uncertainty about cue validities at any given moment. Relying strongly on past causal beliefs about these cues carries the risk of using outdated information and making wrong decisions. An example from the financial domain may illustrate this idea: Because economic interactions are inherently dynamic, stochastically changing over time (Lo & Mueller, 2010), a cue that was valid at one point can have a variety of potential outcomes in the future. Consequently, the validity of a cue may not appear very reliable over time—for instance, even the long-term survival or good characteristics of a company cannot predict its future investment potential (Alchian, 1950; Lakonishok, Shleifer, & Vishny, 1994). People, therefore, might have relatively weak causal beliefs in the financial domain and be more willing to continually update them to reflect the current market situation (Munier, 1991). In this vein, studies show that individual investors rather rely on recent past returns (DeBondt, 1993) or fads and fashions (DeLong, Shleifer, Summers, & Waldmann, 1990) to make up their expectations for future outcomes.

1.3. Causal beliefs in decision making

Previous research has shown that people cannot and do not fully process all available information in the environment (Simon, 1990). Information search can be limited by focusing on the most relevant cues (Garcia-Retamero, Hoffrage, & Dieckmann, 2007; Gigerenzer & Brighton, 2009). As a result, decision making can improve: It becomes faster, because less computation is needed, and frugal, because only certain information is considered (Gigerenzer, 2008). One way people select and structure the information in their environment is to apply mental models about cause-and-effect relationships to identify the most relevant cues (Garcia-Retamero, Wallin, & Dieckmann, 2007; Tversky & Kahneman, 1974; Waldmann & Hagmayer, 2001; Waldmann, Hagmayer, & Blaisdell, 2006). Causal beliefs or prior experience can thereby boosts fast and frugal decision making (Garcia-Retamero, Hoffrage, & Dieckmann, 2007). For instance, an experience with a poisonous substance is likely to keep an agent away from the substance in the future in a wide range of species (Garcia & Koelling, 1966). Consequently, inferences about causal relations often frame decisions and can be considered as hypotheses that are tested and updated with new evidence (Koslowski, 1996).

On the other hand, causal beliefs can also interfere with the accurate evaluation of new empirical evidence (i.e., cue validities in the environment) resulting in a neglect of contradictory information: Even scientists and clinicians have been shown to disregard findings that are not in line with their previous assumptions (Fugelsang, Stein, Green, & Dunbar, 2004; Haynes, 2009). Psychological literature often refers to this phenomenon as "confirmation bias" (Wason, 1960; see also Klayman & Ha, 1987). Research documented that the reliance on causal beliefs and neglect of empirical evidence is larger in causal judgments than in decision making (Garcia-Retamero, Müller, Catena, & Maldonado, 2009). One study also showed that participants increase the reliance on the empirical evidence under certain conditions: (1) When provided with pre-training of neutral cues (i.e., cues that are not causally related with the outcome), (2) greater amounts of empirical evidence, or (3) highly discriminative cues. In addition, studies have found some dissociation between causal judgments and decision making (Fugelsang et al., 2004; Müller et al., 2011).

The influence of causal beliefs and empirical evidence in decision making is still relatively poorly understood (Griffiths & Tenenbaum, 2005; Meder, Hagmayer, & Waldmann, 2009; Sloman & Hagmayer, 2006; see Garcia-Retamero, Hoffrage, Müller, & Maldonado, 2010, for a review). A great body of literature highlights the influence of causal beliefs in human causal reasoning and causal judgments (see Perales and Catena, 2006 for a review), but there is a dearth of research integrating the influence of causal beliefs in models aiming to explain decision making. For instance, the *fast and frugal heuristics research program* (Gigerenzer et al., 1999) shows that among other heuristics, people often use *take-the-best*, a noncompensatory decision strategy (Gigerenzer and Goldstein, 1996). Take-the-best is a heuristic constructed from three building blocks: A *search rule* (take-the-best looks up the cue with the highest validity), a *stopping rule* (take-the-best stops after the first discriminating cue), and a *decision rule* (take-the-best chooses the alternative after the first discriminating cue). However, in studies that confirmed people's use of the take-the-best heuristic, participants often got information about cue validities or were encouraged to use cues in order of their validity (e.g., Bröder, 2003). Consequently, a comparison with other search strategies revealed that validity did not predict people's search processes best (Newell, Rakow, Weston, & Shanks, 2004). In many daily-life contexts, computations of cue validity would be intractable, considering that people face countless potential cues in the environment that can be used to make a decision (Juslin and Persson, 2002; see also Garcia-Retamero, Wallin, & Dieckmann, 2007).

1.4. Overview of the experiments

Recent attempts aim at mapping the influence of causal beliefs not only in judgments but also in decision making (Meder et al., 2009; Müller et al., 2011; Sloman & Hagmayer, 2006). With the present studies, we sought to extend this research by comparing the impact of causal beliefs and empirical evidence in two different domains (medical and financial), thereby showing the domains' influence in causal attribution (i.e., judgments about the causal power of cues to bring about an effect) and decision making (i.e., choices between alternatives on the basis of cues).

In two experiments, we aimed at demonstrating that causal beliefs are domain-specific (i.e., that the strength of a causal belief depends on a specific domain). We applied a two-alternative forced-choice task, where participants had to decide between two alternatives framed either in a medical or a financial domain. Participants in the medical group had to choose between two patients and select the one "who would be more likely to get a heart disease". Participants in the financial group had to choose between two companies and select the one "that would be more likely to experience a decrease in their share price". The choice in favor of one alternative formed part of the variable *decision making*. Decisions could be made on the basis of four available cues—presented as boxes on the screen. Participants had to click on the respective box to see the values for a particular cue. To indicate the causal strength associated with these cues, we also asked participants to make a causal attribution about the effect of each cue on the outcome (i.e., a causal judgment). We had three hypotheses: First, we hypothesized that the effect of causal beliefs would be stronger in the medical than in the financial domain (H1). People might perceive cue validities as stable over time in the medical domain but as rather variable in the financial domain. Second, following the previous assumptions, we hypothesized that participants would be more likely to adapt to empirical evidence (i.e., cue validities) in the financial than in the medical domain (H2). Finally, in line with our recent research