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Distorting the probability of treatment success to justify treatment decisions

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Abstract

This research examines the value-induced bias: do people justify medical decisions by distorting their perception of relevant probabilities? Subjects were given a "close-call" decision which involved weighing one week of treatment side effects with a low probability of treatment success against seven more weeks of having the disease symptoms. They were told a numeric probability estimate of treatment success for the population as a whole. Those subjects with the ability to justify getting (not getting) treatment inflated (reduced) their numeric probability judgment of treatment success relative to those without this ability. As in cognitive dissonance reduction, risk perceptions can be distorted to align beliefs with preferences. Distorted risk perceptions may lead to suboptimal medical decisions.

Keywords: Value-induced bias; Cognitive dissonance; Subjective probability; Risk perception

Biases in information processing, perception and judgment, which result from natural cognitive limitations and motivational drives, have long been recognized to influence medical decisions (Arkes, Harkness, Saville, & Wortmann, 1981; Baron, 2000; Chapman & Elstein, 2000; Christensen-Szalanske & Bushyhead, 1981; Dawson & Arkes, 1987; Hershey & Baron, 1987; Johnson, Duran, Hassebrock, Moller, & Prietula, 1981; Kahneman, Slovic, & Tversky, 1982). One such cognitive bias is the value-induced bias, in which the nature of an outcome influences judgments of its probability of occurring (Wallsten, 1981). For instance, a patient may adopt an inappropriately high perception of the risk of cancer because of the seriousness of cancer or to justify getting an unpleasant cancer screening test with unnecessary frequency. Value-induced bias violates a principle of decision theory, which holds that the probability of an outcome is independent of its value or importance (Raiffa & Schlaifer, 1961).

Value-induced bias can be thought of as a type of cognitive dissonance reduction. Cognitive dissonance is the discomfort experienced when there is inconsistency between multiple cognitions or behaviors (Aronson, Wilson, & Akert, 1997). To reduce this discomfort, we adjust or distort one of the cognitions to justify the other or to make the cognitions consistent with each other. In fact, one of the American Heritage Dictionary's (The American Heritage Stedman's Medical Dictionary, 2002) definitions for "distortion" is "a psychological defense mechanism that helps to repress or disguise unacceptable thoughts." Smokers, for example, may try to align their knowledge of the harms of smoking with

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their smoking behavior to reduce or avoid dissonance. They may change the belief that smoking is harmful by convincing themselves that the data on the harms of smoking is inconclusive. Alternatively, they may try to add new cognitions to reduce the perceived threat, such as adopting the belief that the filter traps the truly harmful chemicals in the cigarette (Aronson et al., 1997). It is clear that people will engage in extraordinary rationalizations or distortions to reduce the discomfort of cognitive dissonance.

As suggested by the rationalizations of smokers, the distortions that can result from engaging in the value-induced bias can adversely impact medical decisions. Normative decision making models posit that medical decisions ought to be based on the true disutility (i.e., severity) and probability of the possible outcomes associated with each option (Edwards, 1954; Fishbein & Ajzen, 1975; Janz & Becker, 1984). Descriptive models of health behavior, and the research that supports them, indicate that perceptions of the probabilities of relevant outcomes do influence health decisions and behaviors (Aiken, West, Woodward, & Reno, 1994; King, Rimer, Balshem, Ross, & Seay, 1993; McCaul, Branstetter, Schroeder, & Glasgow, 1996). Engaging in the value-induced bias (i.e., distorting the probability of relevant outcomes to justify one's preferred choice) can create misperceptions of the decision options and may result in suboptimal decisions by patients and physicians.

Work by Russo and colleagues demonstrated what they called "pre-decisional distortion" of attributes of different products due to a pre-existing preference in the context of making a hypothetical choice from among the products (Russo, Medvec, & Meloy, 1996; Russo, Meloy, & Medvec, 1998). The only studies to our knowledge that have investigated distortion of probability of medical outcomes to justify decisions are two studies that concluded that there was a value-induced bias among physicians making diagnostic judgments. First, Wallsten (1981) found that, relative to judgments made by a computer, physician judges assigned a higher probability to a patient having a malignant tumor than a cyst, despite the higher objective probability of a cyst. This tendency was attributed to a value-induced bias; the greater importance of ruling out a tumor compared to a cyst, argued the author, led to the inflation of the subjective probability of a tumor. However, we note that the finding in this study that physicians gave high probability judgments for the tumor may not be due to value-induced bias. Rather, it may simply be the result of the common error of overestimating the likelihood of a low probability event (Baron, 2000). In a second study, Poses, Cebul, Collins, and Fager (1985) found that physicians who had already recommended antibiotics for patients with symptoms of strep throat assigned a higher probability to a strep diagnosis than those who had not. Poses et al. (1985) concluded that the physicians were also committing the value-induced bias, that they were justifying their diagnosis and treatment recommendation by raising the probability of strep. However, this conclusion is also problematic because the reverse pathway (i.e., a higher probability judgment leading to the treatment recommendation) cannot be ruled out.

Thus, the purpose of our research was to seek evidence for the value-induced bias while overcoming the aforementioned limitations in the interpretability of the results of previous research on this bias and to examine this bias in the medical decisions of laypeople (i.e., potential patients). We also wanted to see if value-induced bias with respect to distortion of probability would occur even when subjects are first given a numeric probability estimate for the population as a whole.

We conducted a web-based study to examine whether laypeople's medical decision preferences lead to a value-induced bias. We hypothesized that to justify getting treatment (or not), those with a formulated desire for (or against) a medical treatment would increase (or decrease) their subjective probability of the treatment's success compared with those without a formulated desire.

Methods

With Institutional Review Board approval from the University of Pennsylvania, we placed a questionnaire on the World Wide Web (http://www.psych.upenn.edu/~baron/qs.html) and offered $2 in exchange for completing the questionnaire. Subjects discover this website because it is linked from many other sites that list surveys for pay on the Internet and how to earn money on the Internet. The website indicates when the next questionnaire for pay will be posted and subjects can then return to the site at that time if they wish to participate.

Use of the Web for research has several advantages over the alternatives for this kind of research (usually conducted with undergraduates): the subjects are much more varied than those from other convenience samples; expenses connected with data entry and checking are reduced; and, because the web questionnaire can be programmed to check answers as the subject enters them, and request corrections when necessary (e.g., if the answer is beyond the appropriate range of responses), and fewer responses need to be discarded because they are nonsensical (Baron & Siepmann, 2000). Moreover, the general quality of the data is at least as high as that of data from paper questionnaires, and, in general, substantive results do not differ from those of comparable methods (Birnbaum, 1999, 2000; Epstein, Klinkenberg, Wiley, & McKinley, 2001; McGraw, Tew, & Williams, 2000). Because subjects are paid, it is possible to track individual identities to ensure that no one completes the same study twice.