

Editorial:

INFLUENCE OF FRAMING ON MEDICAL DECISION MAKING

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ABSTRACT

Numerous studies have demonstrated the robustness of the framing effect in a variety of contexts, especially in medical decision making. Unfortunately, research is still inconsistent as to how so many variables impact framing effects in medical decision making. Additionally, much attention should be paid to the framing effect not only in hypothetical scenarios but also in clinical experience.

FRAMING IN DECISION MAKING

When making decisions, people will be influenced by the different semantic descriptions of the same issue, and have different risk preferences, which is called the framing effect indicating that people make decisions based on the potential value of losses and gains rather than the final outcome. For example, in the Tversky and Kahneman's (1981) landmark study on the framing effect, participants were presented with a classic framing effect problem, named the "Asian Disease" design. The scenarios were presented below:

Imagine that the U.S. is preparing for the outbreak of an unusual Asian disease, which is expected to kill 600 people. Two alternative programs to combat the disease have been proposed. Assume that the exact scientific estimation of the consequences of the programs is as follows:

Positive frame (Lives Saved Frame):

If Program A is adopted, 200 people will be saved.

If Program B is adopted, there is a one-third probability that 600 people will be saved and a two-thirds probability that no people will be saved.

Which of the two programs would you favor?

Negative frame (Lives Lost Frame):

If Program C is adopted, 400 people will die.

If Program D is adopted, there is a one-third probability that nobody will die and a two-thirds probability that 600 people will die.

Which of the two programs would you favor?

Obviously, both A and C are the same risk-averse options, while B and D are the identical risk-seeking options. However, participants were more likely to choose the risk-averse option (Program A) when confronted with the positive frame, and choose the risk-seeking option (Program D) when confronted with the negative frame. From then on, the framing effect becomes a well-documented bias in a variety of studies.

Since then, numerous studies have demonstrated the robustness of the framing effect in a variety of contexts. We aimed to review literature on framing effect in medical decision, and compare the influence of features of subjects upon framing effects on medical decision making.

DECISION-MAKING THEORIES AND THE FRAMING EFFECT

In early decision-making studies, the most popular theories include expected utility theory (EU) and subjectively expected utility theory (SEU). These theories base on "rational hypothesis" to explain and predict human behaviors. It is assumed that decision makers' capabilities are flawless and limitless, and the preferences to the greatest expected utility are uninfluenced by the description of the programs when some basic principles are followed, such as ordering alternatives, dominance, cancellation, continuity, and so on (Nelson et al., 2005). However, such hypothesis is questioned by Simon (1956) who believes that organisms adapt well enough to "satisfice"; and they do not, in general, "optimize". He also points out the concept of "bounded rationality" which means that the individual's cognitive capacity is limited, and he or she is unable to seek all of the information and weight each option to its probability and utility for "optimal" results. As Simon declares, an organism requires only very simple perceptual and choice mechanisms to "satisfy its several needs", and no "utility function" needs to be postulated for the organism, nor does it require any elaborate procedure for calculating marginal rates of substitution among different wants (Simon, 1956). Many following studies have indicated that participants make decisions in violation of utility theory (Baron, 2000).

Based on Simon's studies, Tversky and Kahneman put forward the famous "Prospect theory" which indicates that potential outcomes are weighted in light of the probability that the outcome will occur, and the potential outcomes are considered as either gains or losses from a neutral point. Fur-

ther, the existence of the framing effect is also confirmed by them with the famous original "Asian disease" experiment (Tversky and Kahneman, 1981), and since then, numerous studies have demonstrated the robustness of the framing effect in a variety of contexts in which three main types of framing effects are put forward: (a) Risky choice framing: the classical framing effect to influence decision makers' willingness to take risks, like the often cited example "Asian disease dilemma"; (b) Attribute framing: manipulating the presentation of a specific characteristic of a subject. One of the classical examples is from Levin and Gaeth's features of meat described as being 25 % fat or as 75 % lean. The description of 75 % lean meat in a positive frame is judged more desirable than the negatively framed description of 25 % fat meat, suggesting a attribute framing (Levin and Gaeth, 1988); (3) Goal framing: the impact of persuasive information about outcomes upon decision makers' behaviors.

It is also indicated that the framing effect involves several underlying psychological mechanisms, and different perceptual or cognitive processes could be employed to explain the unique features of the framing effect. For example, Tversky and Kahneman (1974) propose that three of the most common heuristics are utilized by participants to make a decision: the representativeness heuristic, the availability heuristic, and the adjustment and anchoring heuristic, each of which could give rise to biased decision making. For example, decision making would be influenced by the availability heuristic, when the participants made medical decisions based on the most available information in their long-term memory (Tversky and Kahneman, 1973), although the rational options should be chosen by thinking over all the pieces of information and alternatives relevant to the final decision.

According to the Yates and Sieck's explanations for the presence of the framing effect (Yates, 1990; Sieck and Yates, 1997), participants often draw a conclusion based

simply upon the given information, regardless of additional information which is worth being incorporated into the final decision making. To avoid the ignorance of the unmentioned information during the decision making process, the requirements of providing justification for their decision are necessary for participants (Kim et al., 2005; Miller and Fagley, 1991). Miu and Crişan (2011) reported supportive findings that cognitive reappraisal reduced the susceptibility to framing by effectively regulating the emotions associated with the decision frames.

Stanovich and West (2000) proposed that there were two routes for information processing: holistic and analytic. In holistic process participants made faster conclusions relying on provided cues. Such processing allowed individuals to focus on contextual and manipulative information, which led to a biased decision making. Whatever, it has been approved that the framing effect overwhelms the basis of expected utility theory, and intrigues the following researchers to devote themselves to this domain.

KEY FACTORS RELEVANT FOR FRAMING EFFECTS

As is well known, older people are the ones who are more likely to make very important and life-threatening medical decisions than any other age group. Some researchers argued that older adults are more susceptible to decisional biases than younger adults (Park, 1999; Yates & Patalano, 1999). Similarly, it had also been reported that older participants were more likely to be susceptible to the framing effect (Kim et al., 2005).

As difference in individual thinking styles could account for the variability of the framing effect, for instance, participants who were able to think all information over would avoid the biased decision (McElroy and Seta, 2003), Park proposed that age-related deterioration in cognitive ability and impaired information processing could account for the older participants' engagement

in biased decision making, though it was suggested that older adults' accumulated experience and knowledge would minimize biases of the decision making (Zwahr, 1995). Similarly, Yates and Patalano (1999) agreed that the older adults' susceptibility to the framing effect could be also explained by their different ways of thinking, for example, it was reported that it costs older adults less time to make medical decision than younger adults (Leventhal et al., 1993), relied on less information about treatment options (Meyer et al., 1995). In other words, the older adults would make final decisions faster than the younger, and relied mainly on the use of heuristics and the holistic approach to decision making.

However, a recent study failed to find the significant difference across age groups in intentions to engage in detection behaviors (Stoner, 2010). Another study examined how the type of information used in the decision making process varied by frame and age. It was found that two main decisional strategies were used by all participants: (a) one reflected a data-driven decisional process; (b) the other reflected an experience-driven process. The results showed that older adults were less likely to use a data-driven strategy compared to younger adults, but only those using a data-driven strategy demonstrated framing effects, which implied that the framing effect might be more related to decisional strategy than to age (Woodhead et al., 2011). Specifically, Woodhead's study (2006) indicated that the presence of the framing effect was determined not only by the participants' ages but also the outcome information types. It was shown in this study that the framing effect occurred in younger participants with the cumulative and interval probability formats, and in older adults with in the interval probability format. Woodhead's studies demonstrated the interaction between age and other variables which could explain the presence and absence of the framing effect mentioned above to some extent. To sum up, decision makers are influenced by the framed information, but

research is still inconsistent as to whether and how age impacts framing effects.

When older adults or patients make decisions regarding choices of treatment, they often turn to relatives or friends for discussion and suggestion. They can hardly make final decisions depending solely on themselves. Decision-making biases do exist in group decisions, for example, sunk-cost bias and confirmation bias (Smith et al., 1998; Schulz-Hardt et al., 2000). Stoner (2007) investigated medical decision making among older participants (as individual or part of dyad) faced with positively or negatively framed information (survival or mortality) regarding a choice between receiving surgery or radiation for treating lung cancer. Outcome format comprised three levels: cumulative probability, interval probability, and total life expectancy. This study found that the framing effect occurred not only in older adult individual but also older adult collaborative decision makers in at least one of the three data formats presented. Among the participants who showed the framing effect, there was no difference between the proportion of individual and collaborative decision makers. What's more, the influence of group composition upon decision making was investigated by Yaniv (2011) who found that, in comparison to individual preferences, the homogeneous groups' preferences were polarized, and thus the framing effect was amplified; in contrast, the heterogeneous groups' preferences converged, and thus the framing effect was reduced to zero.

It has been found that many individual difference variables could account for the changes of the framing effect in health decisions including impulsiveness, involvement in personal healthcare, and feelings towards personal health status (Lauriola et al., 2005). Sometimes the effectiveness of framed health communications depends on the message recipient's current emotional state, which has been examined by Gerend and Maner (2011). As predicted, participants in the fear condition reported eating more servings of fruits and vegetables after

exposure to a loss-framed message than to a gain-framed message. In contrast, participants in the anger condition reported eating (marginally) more servings of fruits and vegetables after exposure to a gain-framed message than to a loss-framed message. So it was declared by the researchers that affective factors that were incidental to the behavior recommended could influence the relative success of gain- and loss-framed appeals. Another study examined whether affective context moderated the degree to which message frame was associated with behavioral intentions to engage in colorectal cancer screening. As predicted, they found that loss-framed messages were more effective in increasing intentions to screen. However, among individuals who received gain-framed messages (but not loss-framed messages), the affective booster increased message persuasiveness, which was partially mediated by self-efficacy for engaging in screening. This study indicated that in the presence of emotional boosters, loss-framed messages might lose their advantage over gain-framed messages in motivating detection behaviors (Ferrer et al., 2012). In addition, relationship between emotion and risk-seeking were also discussed, and the findings demonstrated a general role for emotion reliance on risk-seeking and a specific role of positive effect on risk-seeking in the loss trials of the framing effect (Cheung and Mikels, 2011). Collectively, there is growing evidence elucidating the relationship between emotion and the framing effect in decision making, especially medical or health-related decision.

It is noticeable that sex could modulate the orientation of the framing effect upon health-related behaviors. It was observed that males and females might make different responses to the same information, for instance, among male adults, higher willingness to engage in health behaviors was induced by the negatively framed messages than the positively framed messages, while the negative frame elicited lower intentions to the prevention behaviors than the posi-

tive frame among female participants (Rothman et al., 1993).

As a matter of fact, sex interacted with other variables to predict preference to medical choices. Huang and Wang (2010) investigated how task domain moderated sex differences in framing effects, and they found that the framing effect was sex-specific, varying according to the gender role in different task domains, which highlighted the necessity to distinguish, rather than combine, individual judgments and decision makings in different task domains when investigating framing effects. Further, another recent study explored individual differences in perspective taking and perspective as moderators of risky choice framing effects. The researchers expected the affective focus would magnify framing effects among men, as they appeared less likely to spontaneously consider how they would feel, which was supported in follow-up analyzes of the five-way interaction of frame, gender, feel, cognitive and affective perspective taking. Such findings suggested that larger framing effects seen for women in previous research may be due to differences in whether one spontaneously considered how one would feel, that is, to individual differences in affective perspective taking (Fagley et al., 2010).

As is well known, bipolar disorder (BD) is associated with high-risk behaviors, such as gambling and impulsivity. Some researchers studied the effects of highlighting rewards versus highlighting punishments in the risky decision making of euthymic individuals with bipolar disorder. They found that the number of bad outcomes arising out of positively framed dilemmas was overestimated by the BD participants, and the framing effect shown in healthy control participants was significantly attenuated in BD participants, which indicated that risky choice in BD was associated with reduced sensitivity to emotional contexts that highlighted rewards or punishments, possibly reflecting altered valuations of prospective gains and losses associated with behavioral options (Chandler et al., 2009). Similarly, it

was also observed in autistic individuals that the framing bias was attenuated. The researchers explained that the framing effect merged in early adolescence as gist-based intuition developed, and the autistic participants relied more on verbatim-based analysis and less on gist-based intuition (Reyna and Brainerd, 2011).

In contrast, the framing effect between healthy older adults, patients with mild cognitive impairment (MCI), and patients with mild Alzheimer's disease (AD) were compared by researchers, and they found that all three groups showed framing effects and judged more favorably the positively-framed medications than the negatively-framed medications. However, framing effects were more pronounced in MCI patients and mild AD patients than in healthy older adults, which suggested that health-related decisions of patients with slight cognitive impairment might be relevantly biased by positive and negative formulations (Zamarian et al., 2010). Interestingly, it was reported that two patients with Urbach-Wiethe (UW) disease exhibited an intact framing effect. However, choice preference in these patients did show a qualitatively distinct pattern compared to controls. As it was suggested by two fMRI studies that the activation in the amygdala was modulated by the framing effect, it was implied that loss of amygdala function did exert an overall influence on risk-taking (Talmi et al., 2010).

Numeracy skill is defined as an ability to understand and manipulate basic probabilities, ratios, and percentiles (Peters et al., 2006). Such skill has been measured in many health and decision making studies, because it exerts effect upon medical decision making (Donelle et al., 2007). As Reyna and Brainerd (2007) went, due to their lack of understanding of risk and probabilities in medical decision making, less numerate adults were likely to be biased and at disadvantage. However, Stoner (2010) tried to investigate the effect of numeracy upon engagement in prevention behaviors, and failed to find the significant

difference across numeracy ability groups. Another study investigated whether numeracy influenced risk perceptions when different information frames and number formats were used to present medication risks. Unfortunately, it was reported that numeracy did not moderate these framing effects (Peters et al., 2010). Noticeably, there is growing evidence that numeracy skill puts impact upon decisions in attribute framing (Peters et al., 2006), but few studies examined the effect of numeracy skill as influencing factors upon health-related behaviors.

Participants' prior experiences with the medical decision and the indirect knowledge from their relatives or friends could be considered as positive factors to help them to make well-informed and unbiased medical decisions. In other words, adults could be protected by such prior experiences and knowledge from the influence of the framing effect (Hughes, 1993).

According to adults' sensitivity to negative affairs, fun seeking, and rewards (BIS/BAS scale; Carver and White, 1994), participants could be divided into the group with approach motivation who were motivated by incentives, and the group with avoidance motivation who were propelled by potential punishment. It had been demonstrated that the former group was easily promoted to engage in health-related behaviors by positive information, while the latter group was more likely to be motivated to perform such behaviors by negatively framed information than positively framed information (Mann et al., 2004).

A recent study examined the effects of gain- and loss-framed messages on HIV-testing intentions moderated by perceived risk of a positive result. Their findings demonstrated an advantage for the loss-framed message among women with some perceived risk and an advantage for the gain-framed message among women with low perceived risk, which implied that risk perception was an important moderator of framing effects (Hull, 2012).

In addition, some researchers investigated the joint effect of message framing and time perspective in adherence-promoting communication targeting patients with chronic diseases, and they found that the gain frame showed an advantage over the loss frame among future-oriented patients, whereas the framing effect was relatively indistinct for present-oriented patients, which corroborated the hypotheses proposed from previous framing and time perspective research (Zhao et al., 2012).

MANY VARIABLES AND INCONSISTENT FINDINGS

Many studies have confirmed the framing effect (Kim et al., 2005, LeBoeuf and Shafir, 2003; Mayhorn et al., 2002), however, others failed to report the presence of the framing effect (McElroy and Seta, 2003; Sieck and Yates, 1997; Takemura, 1994). Many studies were inconsistent in their methodology, which also led to the different conclusions and findings in the presence of the framing effect. As mentioned above, there are so many variables influencing the framing effect in medical decision making, and most of the variables interact with others. However, a majority of studies are only able to investigate several influencing factors, because the more variables they concern, the more participants and questionnaires are demanded in these studies. Therefore, large-scale joint researches, with regard to variables as many as possible, are needed to draw the reliable and consistent conclusions of the framing effect in medical decision making.

ACTUAL PROBLEMS ARE OFTEN MORE COMPLEX THAN THOSE DESIGNED IN EXPERIMENTS

Tversky and Kahneman's prospect theory can be often used to explain the framing effect, namely, the possible outcomes will be coded by people as "gain" or "loss". As a matter of fact, the actual problems are often more complex than those designed in the experiments. In their daily lives, people

usually find themselves in certain decision-making situations in which they have to be confronted with both "gain" and "loss" simultaneously.

CLASSICAL FRAMING EFFECTS AND DECISION THEORIES FROM THE WESTERN MIGHT NOT BE SUITABLE FOR THE CHINESE PEOPLE

As is well known, human being is of sociality, which demonstrates that his or her decision making will be determined by living style, cultural background, demographic differences, and so on. Therefore, Classical framing effects and decision theories from the Western might not be suitable for the Chinese people, and we have no choice but explore the Chinese risk preferences under different circumstances in China.

Although there have been thousands of studies of framing effects in medical decision making in the Western, there is few studies of framing effects in Asia, especially in medical decision making. In Asia, very a few relevant studies concerning the framing effect are almost limited to the domains of finance, administration, etc. To sum up, the research about the application of the framing effect to the medical decision in Asia is scarce.

All in all, the framing effect has been observed in more and more studies about medical decision making. However, there is still discrepancy in the previous literature, because so many variables and factors influence the presence of the framing effect in medical decision making. Much effort is needed to explore the relationship between the features of subjects and framing effect in medical decision making, especially in Asia, and there is still a long way to go.

ACKNOWLEDGMENTS

This article was supported by grants from Beijing Natural Science Foundation (No. 7123230) and the National Natural Science Foundation of China (Grant No. 31000461 and 81171100).

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