What lies beneath: Reframing framing effects

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Decision framing concerns how individuals build internal representations of problems and how these determine the choices that they make. Research in this area has been dominated by studies of the framing effect, showing reversals in preference associated with the form in which a decision problem is presented. While there are studies that fail to reveal this effect, there is at present no theory that can explain why and when the effect occurs. The purpose of this article is to present a selective review of research and use this to argue for a new framework for considering decision framing, to interpret past studies, and to set an agenda for future research. A simple information-processing model is developed. The model provides the basis for arguing that previous research has taken too narrow a view of how decision problems are internally represented and how these representations are transformed into choice behaviour. In addition, the model is used to highlight the importance of decision content and context.

The concept of framing, so central to the development of Prospect Theory (Kahneman & Tversky, 1979), is concerned with the ways in which individuals build internal representations of decision problems and how these determine the choices that they make.

Kahneman and Tversky (1979) argued that framing occurs in a preliminary phase of the choice process, which involves a set of editing operations. One of these operations, *coding*, represents the value to the individual of the decision outcomes as gains and losses from a neutral reference point. While this reference point may simply be the decision-maker's current asset position, it may also vary as a function of both the formulation of the prospects and the decision-maker's expectations. This view differs significantly from that of classical Expected Utility Theory, which assumes outcomes are represented as final states of wealth. Critical to this approach is the suggestion that the same decision situation can be

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framed from different reference points, leading to different representations that, in turn, can lead to inconsistencies in choice behaviour. Perhaps the most famous illustration of this is the Asian Disease problem (Tversky & Kahneman, 1981), where participants are presented with the following paragraph:

> Imagine that the US is preparing for the outbreak of an unusual Asian disease, which is expected to kill 600 people. Two alternative programmes to combat the disease have been proposed. Assume that the exact scientific estimates of the consequences of the programmes are as follows.

For half the participants the two programmes are described in terms that induce them to adopt a reference point that leads the outcomes to be modelled as gains:

(A1)   If Programme A is adopted, 200 people will be saved. (72%)
(B1)   If Programme B is adopted, there is one-third probability that 600 people will be saved and two-thirds probability that no people will be saved. (28%)

For the other half of the participants, the two programmes are described in terms that induce a different reference point which leads to the outcomes being modelled as losses:

(A2)   If Programme A is adopted, 400 people will die. (22%)
(B2)   If Programme B is adopted, there is a one-third probability that nobody will die and a two-thirds probability that 600 people will die. (78%)

Tversky and Kahneman (1981) reported that the percentage of participants choosing each alternative (indicated by the numbers in parentheses above) reveals a general tendency towards risk aversion in the positively framed version of the problem and risk seeking in the negatively framed version. This pattern of responses, which corresponds to the framing effect, indicates a reversal in preference associated with the form in which the problem is presented. As such it violates one of the fundamental axioms of rational decision theory, the invariance axiom, prescribing that choice should remain invariant across logically equivalent versions of the decision options (Arrow, 1982). In addition, this framing effect suggests that choice behaviour may be affected by the way decision information is presented (i.e., which reference point is adopted) rather than reflecting the fundamental beliefs and values of the decision-maker.

Since this initial study there have been many replications of the framing effect as well as other studies identifying some of the conditions that

strengthen and weaken it (see Kühberger, 1998). The impact of this work on behavioural decision making and behavioural economics has been enormous. For example, Kühberger (1998) undertook a meta-analysis of the framing effect and was able to draw on 136 articles, and there have been many more since. As the area developed, the experimental situations adopted became so diversified that the term "framing" became increasingly ambiguous. Levin, Schneider, and Gaeth (1998) suggested that this ambiguity could be resolved by distinguishing between three different types of framing effect—risky choice framing, attribute framing, and goal framing. Risky choice framing, similar to the Asian Disease problem described above, concerns changes in risk attitudes when outcomes are framed positively or negatively. In contrast, work on attribute framing has shown that evaluations of objects or people are different depending on whether the key attributes are described in positive or negative terms (e.g., a meat product consists of 80% beef rather than 20% fat). Finally goal-framing effects are based on differences between messages that stress the positive consequences of performing an act as compared with the negative consequences of not performing the act (e.g., presenting the positive outcomes of engaging in an act such as breast self-examination rather than the negative outcomes of not engaging in this act).

   The primary objectives of this article are to briefly review research on decision framing in order to identify some of the contradictions and controversies, and to argue that research has been too narrowly focused on the framing effect and that the broader and more important issue of decision framing has been neglected. We outline a simple model to clarify key issues around decision framing, showing that context and content can induce problem representations that are very different from those predicted by Prospect Theory. Whereas Kahneman and Tversky's initial views on framing effects have generally dominated the research agenda, we argue there is now a need for a comprehensive theory of framing that explains the different ways in which people internally represent decision problems, if we are to explain why, when, and to what extent framing effects occur.

REVIEW OF RESEARCH ON FRAMING

Method

We began our selective review of framing research by performing a citation reference search with the ISI Web of Knowledge® database. We searched for citations of Tversky and Kahneman (1981) and Kahneman and Tversky (1984), both key articles on framing. In order to reduce the set of articles found to a manageable size, we then selected the articles using the keywords "frame(s)" or "framing" either in their title or in the topic field. Next, we

reviewed titles and abstracts and eliminated articles that did not directly address framing issues, and then categorised the remaining articles in relation to their main domain of application. Finally, rather than conducting an exhaustive literature review of all these studies (see Kühberger, 1998; Levin et al., 1998 for such reviews), we selected two exemplar domains that have not always been fully recognised by the judgement and decision-making community, medical and political decision making, using each as basis for evaluating how notions of decision framing have developed since Kahneman and Tversky's initial research.

Results

Citations and domains of applications.   On 11 April 2005 an impressive 2521 research articles made reference to either or both of Tversky and Kahneman's (1981) and Kahneman and Tversky's (1984) articles. Among these articles, 427 referred explicitly to framing effects or decision frames. After reviewing titles and abstracts, this sample was reduced to 371 articles. The domains of applications of these articles were diverse, as Figure 1 illustrates. Some ($N = 118$) were directly relevant to the psychology literature and mostly concerned with investigations of the determinants and mediators of framing effects (e.g., cognitive elaboration, task domain). Contributions originated from scholars in judgement and decision making, cognitive psychology, and social psychology. However, this fundamental work represented approximately one third of the research on framing. The remaining contributions studied framing in applied settings. The largest volume of articles was within the field of business and economics ($N = 98$), including work on consumer behaviour, marketing, finance, and management. This was closely followed by applications in health and medicine ($N = 72$) and political science ($N = 38$). The remaining articles ($N = 45$) included applications in various domains including sociology, law, and communication studies. This cursory analysis reveals the huge impact that
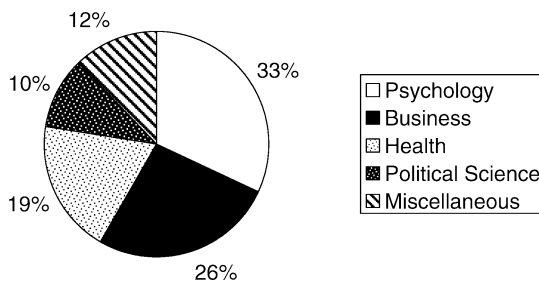

Figure 1. Domains of application of framing studies.

notions of framing have had across the social sciences and the critical role that Kahneman's work has had in the development of these areas of study. We selected two areas, health and political science, and undertook a brief but critical review to determine the primary focus of work in each.

Framing in health decision making.   While decision scientists have mainly used laboratory research, health researchers have recognised the importance of the framing effect for behaviours in the everyday world, particularly for predicting choices following persuasive health messages (Salovey & Williams-Piehota, 2004). The effect was first investigated in this context by Meyerowitz and Chaiken (1987) in a study on breast self-examination (BSe). Previous research had suggested women might not perform BSe because of the perceived immediate risks from engaging in this activity. From this perspective, BSe was conceptualised as a risk-seeking behaviour and its absence as a risk-averse choice. The authors reasoned that if individuals are risk-seeking in loss-framed situations, then emphasising what may be lost by not performing BSe should lead to a higher rate of compliance than emphasising what may be gained from the execution of BSe. Results confirmed that individuals who had been presented with the loss-framed information reported a higher frequency of BSe behaviours.

Subsequent studies of health message framing have broadly replicated the Meyerowitz and Chaiken (1987) findings (see Salovey & Williams-Piehota, 2004, for a recent review). However, there have been three criticisms of this work, each of which has generated discussions that are germane to the objectives of this article. The first criticism concerns how the safe and risky choice options are to be specified. Levin et al. (1998) argued that since choosing not to perform BSe is at least as risky as choosing to comply (i.e., overlooked tumours may turn out to be fatal), Prospect Theory could not account for the observed framing effects. However, a closer inspection of the health literature reveals a compelling counterargument to this criticism. Though Levin et al. (1998) are correct in classifying the absence of health detection behaviours such as BSe as a risky choice, results show that individuals usually *perceive* its implementation to be even riskier. This can be explained by the fact that individuals tend to focus more on short-term rather than long-term consequences (Meyer & Hutchinson, 2001). Consequently, the immediate effect of discovering one is severely ill tends to be a more salient risk than the long-term effect of not detecting a life-threatening tumour. Thus Rothman and Salovey (1997) suggested it was the *subjective* assessment of the behaviour as the riskier choice that made the loss-framed messages more effective at increasing behavioural uptake, thereby justifying the framing-based explanation of these findings.

A second criticism stems from Kühberger's meta-analysis (1998) showing a lack of consistency between studies of message framing, with many failing

to show a significant framing effect. Here again, however, one should be cautious in interpreting this result. Indeed, Kühberger's analysis of message-framing studies did not take into account a critical distinction first introduced by Rothman and Salovey (1997). These authors highlighted the need to distinguish between health *detection* behaviours (e.g., BSe or cancer screening) and health *prevention* behaviours (e.g., using a car seat-belt or following a healthy diet). In contrast to detection behaviours, prevention behaviours are generally considered risk-free alternatives by participants because the immediate outcomes merely maintain current health status while reducing their risk of future negative health states. Consequently, and in agreement with the predictions based on Prospect Theory, people are more likely to perform health prevention behaviours after they are presented with a gain-framed message. So it is not that the message framing produces inconsistent results, but rather that these effects are dependent on the characteristics of the behaviour being considered.

A third criticism arising from research in the domain of health concerns work showing that participants' existing intentions and goals may moderate the framing effect. For example, Wong and McMurray (2002) showed that smokers respond differently to messages depending on their prior intentions regarding smoking (i.e., whether or not they intended to give up smoking). This result suggests a possible explanation for an otherwise puzzling finding that framing effects are best elicited when using the Asian Disease problem (Kühberger, 1998). In contrast to decisions about smoking, prior intentions should be quite homogeneous with the matters of life and death presented in the Asian Disease problem, as most participants would presumably intend to save lives and minimise loss. This homogeneity of intentions could therefore be an explanation for the unusual efficacy of the Asian Disease problem in eliciting framing effects. However, in other domains (e.g., smoking cessation) less homogeneity in intentions would be expected, resulting in diminished effects.

Responses to the three criticisms presented above raise important issues for our understanding of decision framing. They highlight the discrepancy between fundamental assumptions about what influences decision framing (e.g., the objective risks associated with an alternative) and what actually matters to participants (e.g., perceived risk or personal involvement). These responses also point to the importance of specifying the frame from the participant's perspective rather than the researcher's perspective. Rothman and Salovey (1997) developed a ''socio-cognitive'' model of framing, arguing that framing effects occur when the message is processed system-atically so that it is integrated into an individual's mental representation of the health issue. The recipient must be receptive to the proposed frame and accept it. This depends, in part, on the message being consistent with that individual's knowledge, experience, and intentions. As presented next, this

view echoes work in political decision making showing that attitudes and individual involvement are key mediators of framing effects.

Framing in political decision making.   There has been a rich seam of research on decision framing within political science (see for example McDermott, 2004). Here we focus on two aspects of this work concerned with challenging notions of citizen competency and investigating international relations and foreign policy.

A key principle underlying democracy is that citizens are capable of forming reliable preferences and that government needs to be responsive to these preferences (Dahl, 1971). Evidence for framing effects from research in behavioural decision making has been used to challenge the notion of citizen competency. In a recent review, Druckman (2001a) specified two requisites of this notion: first, that preferences should not be determined by the way an issue is formulated (comparable to the invariance axiom), and second, that they should not be influenced by elite manipulation. The first of these requisites is challenged by the existence of framing effects and has led some authors to question the basic principles underlying democracy (Bartels, 1998). The second prerequisite is violated by the occurrence of what Druckman called emphasis framing, where a subset of the relevant information is emphasised and becomes the focus for evaluation and choice. For example, when economic issues are emphasised in an election campaign, then candidates are evaluated and chosen on the basis of their economic policies. Preferences for candidates might change, however, if foreign policy issues are emphasised and election choice is based on this rather than economic considerations.

However, Druckman (2001a) questioned the assumption that framing effects are all-pervasive. He drew on work from within behavioural decision making showing that framing effects are less likely to occur in males (Fagley & Miller, 1990, 1997), for people with high need for cognition (Sieck & Yates, 1997), when individuals have strongly held attitudes or high involvement (Levin et al., 1998), and that they disappear altogether when participants are required to provide a rationale for their choice (Sieck & Yates, 1997). He also drew upon his own research to identify further limitations. For example, Druckman (2001b) reported a study where participants' allegiances to the two big American political parties (Democrats and Republicans) was determined, followed some 3 weeks later by a framing study based on the Asian Disease problem. Half the participants completed the original problem while the other half completed a variant where the options were referred to as the Democrat or Republican programme rather then Programme A or B, as in the original. While the usual framing effect was found in the original problem, this disappeared in the variant, with party loyalty providing the primary basis for choice. Since

many people have well-developed preferences in the political domain, these findings suggest that framing effects may be less important in this context. Thus, once again, existing preferences and degree of involvement are shown to mediate the occurrence of framing effects.

A second body of work has investigated framing in international relations and foreign policy. For example, Kanner (2004) considered the role of framing in bargaining in the international domain. He reviewed several studies showing that in trade negotiations and similar situations, states that are facing losses are more risk seeking than states facing gains (e.g., Berejikan, 1997), further broadening the range of domains where framing effects have been shown.

However, Kanner challenged the notion that the frames actors adopt are determined solely by the form in which a problem is presented. He argued that there are bargaining tactics that one actor can use to change the frame of the second actor in a negotiation (e.g., undermining an actor's confidence in their representation of the problem by changing their confidence about future events). He argued that this might be sufficient to induce a participant to reframe a problem, which in turn leads to changes in risk attitude. This suggests that decision frames may be labile and that there are facets other than the derivation of reference points that need to be taken into account.

In sum, research in the domains of health and political decision making raises concerns about how and when framing effects occur, the extent to which Prospect Theory provides a sufficient explanation for the nature of these effects, the importance of a broad range of mediating individual and contextual factors, and the lack of an adequate theory of framing. In the next section we discuss these issues in more detail.

Discussion

The studies reviewed above, taken from rich seams of research in health and political decision making, together demonstrate the huge impact that Kahneman and Tversky's work on framing have had on social science disciplines outside the confines of behavioural decision making. The concept has been applied successfully to predict and explain choice behaviour and to develop effective messages designed to facilitate choice of healthy options. However, both areas of application raise important issues and possible limitations that demand further discussion.

Is there a universal framing effect? A recurring theme across both domains of work we have reviewed, as well as work more generally within judgement and decision-making research, concerns how to account for the

studies that fail to reveal the predicted framing effect. These studies challenge the notion that framing effects are ubiquitous. Levin et al. (1998) pointed out that there are ambiguities when determining which course of action is risky, making it difficult to determine whether the effect has been supported or not. Druckman (2001a) went further by suggesting that the existing body of contradictory findings is sufficient to reject the existence of framing effects in anything other than special circumstances. However, we believe that the weight of evidence, both within behavioural decision making and the areas of application that we have reviewed above, strongly supports the framing effect. Nevertheless, there is a need to account for negative findings.

A fundamental problem with much of the research reporting limitations and failures in the framing effect is that it has been developed without an underlying theory of why these failures might occur. This has given rise to a set of diffuse findings that are difficult to draw together. One notable exception has been work testing the notion that the effect can be reduced or even eliminated when people engage in deeper thought. This view has been supported by findings showing that participants who are asked to provide justifications for their decisions (Tetlock, 1992), or to draw a cognitive map of their representation of the problem prior to choice (Hodgkinson, Bown, Maule, Glaister, & Pearman, 1999), or who model the problem in terms of both the gains and losses involved prior to choice (Maule, 1989), or are selected because of their proclivity for engaging in greater thought (Smith & Levin, 1996), are less likely to show framing effects. These manipulations are assumed to induce greater thought and in so doing induce participants to evaluate options from several reference points. Indeed, Arkes (1991) discussed the prescriptive implications of this work, suggesting that instructions encouraging decision-makers to elaborate their frames might be one way of improving choice behaviour, given that it reduces the likelihood of it being affected by the framing bias.

However, LeBoeuf and Shafir (2003) reviewed studies showing that "more thought less framing" (p. 80) is not universally supported. In addition, they reported two studies of their own showing no differences between those with high and low proclivities for thought when this was compared in a between-subjects analysis, although they showed differences when they undertook a within-subjects analysis. In the latter case, however, all participants' choices on the first presentation of the problem were influenced by problem framing. This finding, and the others they review, challenges the notion that greater thought eliminates the framing effect. Indeed, researchers advocating this view do not explain why viewing the problem from different reference points should eliminate the effect, nor do they explain how the different sets of preferences associated with each reference point are resolved at the point of choice. Tversky and Kahneman

(1981) recognised this problem, pointing out that "it is not obvious which preferences should be abandoned" (p. 458).

We believe that the contradictory findings on the framing effect can be better explained by recognising the very narrow view of framing taken by researchers, due in part to ambiguity surrounding the way the term has been used. In particular, framing has been used to refer both to how a decision problem is formulated by the experimenter and to how a decision-maker internally represents the problem (Kahneman, 2000). This has obscured the distinction between the two, leading many researchers to assume a simple correspondence between them. Kahneman (2000) recognised this confusion, suggesting that using the same term in these two different ways was "helpful in securing acceptance of the concept of framing, but it also had its costs. The use of a single term blurred the important distinction between what decision makers do and what is done to them" (p. xiv).

We believe it is crucial to distinguish between these two uses of the term framing. In Figure 2, we present a very simple information-processing model that maintains this distinction and highlights the importance of understanding (1) how an *internal representation* is constructed from the *problem formulation* presented, and (2) how this representation determines
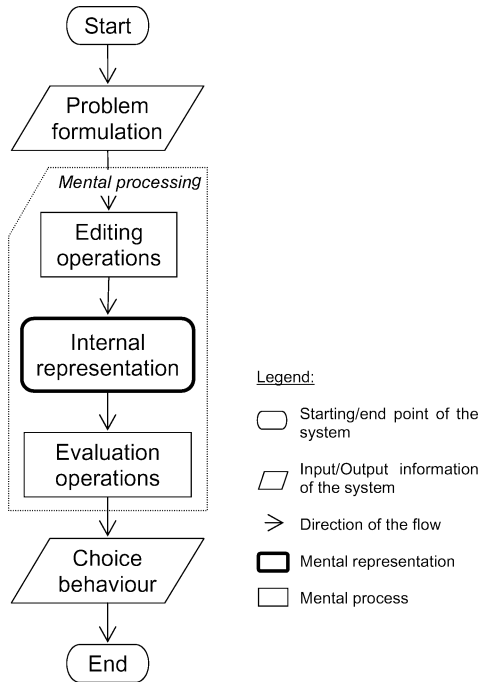

Figure 2. Flow diagram of a simple process model of framing effects.

the *choice behaviour* observed. These two transformations correspond respectively to the editing and the evaluating phases of the choice process originally outlined by Kahneman and Tversky (1979). We consider each in more detail in the section that follows.

How problems are internally represented and choices subsequently made? Within Prospect Theory, a number of simple editing operations are outlined to explain how the preliminary processing of the choice problem leads to a simplified internal representation of the prospects. In addition to coding, described earlier, Kahneman and Tversky (1979) outline other operations that include the combination of probabilities associated with identical outcomes, the cancellation of components shared by different prospect, the rounding of probabilities or outcomes, and the search for dominated alternatives which are rejected without further evaluation. As a result of the application of these editing operations, risky decision problems are assumed to be represented as simplified ''gambles'' expressed in terms of (i) outcomes modelled as gains or losses from a neutral reference point and (ii) their probability of occurrence, independent of the domain of the problem. This largely bottom-up view assuming that internal representations are determined solely by externally presented information is inconsistent with other areas of psychology, such as work on human perception, which have shown that people also use their existing knowledge and experience when modelling the world (e.g., Thomas, 1999).

A very similar point has been made by several other authors (see for example, Bless, Betsch, & Franzen, 1998; Jou, Shanteau, & Harris, 1996; Rettinger & Hastie, 2001, 2003). Rettinger and Hastie (2003) reviewed an important but often neglected study by Wagenaar, Keren, and Lichtenstein (1988) that involved presenting research participants with a series of problem isomorphs of the Asian Disease problem. These problems varied in terms of contextual aspects such as content (e.g., medical vs hostage situation), or the perspective taken (a policy maker vs one of those at risk), while keeping outcome probabilities and utilities constant. These contextual aspects crucially affected choice behaviour. Since all the problems were reducible to the same ''gamble'' structure, these findings indicated that context can lead to important differences in decision-makers' internal representations of problem. This undermines the simple assumption that knowing whether a problem is formulated in gains or losses is sufficient to predict how it is internally represented and, from this, participants' choice behaviour. This is broadly consistent with findings by Fischhoff (1983) showing no relationship between judgements about the best way to frame a problem and subsequent choice behaviour.

The studies reviewed above highlight the importance of focusing directly on framing to determine the precise nature of a decision-maker's internal

representation of a problem. Rettinger and Hastie (2003) discussed several different ways in which framing may occur. These include, but are not limited to, the editing operations proposed in Prospect Theory. For example, Reyna and Brainerd (1995) proposed a different set of editing operations that involve deriving the simplest representation sufficient to allow a choice to be made, leading people to capture the gist of outcomes in terms of fuzzy traces. Rettinger and Hastie (2003) added a third, suggesting a set of editing operations that represent a decision problem in terms of the perceived causal relationships assumed to exist between critical elements of the decision. They argued that the form of the causal model depends crucially on the decision domain. Thus, the causal model could take the form of a physical problem schema in the engineering domain, whereas a physiological system model would be used in medicine.

Further suggestions were outlined by Bless et al. (1998). They drew on work demonstrating the importance of context cues and communication rules (Grice, 1975) and argued that these can affect the transformations considered necessary when internally representing a decision problem. They argued that since the framing effect depends crucially on transformation of an objective into a subjective problem description, then cues signalling that the transformation is not essential should reduce the framing effect. They supported this view by showing that participants given the Asian Disease problem labelled as a medical problem revealed the usual reversal of preference, whereas those given the same problem labelled as a statistical problem did not. The authors argue that labelling as a statistical problem signals little need for further transformation, since the objective values of the outcomes provide "a sound basis for a (statistical) decision" (p. 289). However, labelling as a medical problem signals the need to transform these outcomes into subjective values and in doing so involves engaging the set of editing operations outlined in Prospect Theory.

These are just some examples from a growing body of work revealing that the editing strategies people use when internally representing decision problems may vary across situations according to context and content. These different editing strategies may lead to very different representations of problems from those predicted from the decision-theoretic perspective contained within Prospect Theory. Kahneman's contribution has been to highlight the importance of considering how people model decision problems and providing one representational system for doing this. However, by his own admission, he and Amos Tversky "were initially more interested in framing effects than the activity of framing" (Kahneman, 2000, p. xv), and this interest has, until comparatively recently, dominated the research agenda in this area. Research is now needed to identify other representational systems and to explain why and when each is used. We believe that it will not be possible to resolve issues concerning when and why

framing effects occur, and the strength of these effects, without first developing a comprehensive theory of framing that explains how people internally represent decision problems.

The second transformation identified in the simple model described in Figure 2 concerns the evaluation operations through which choice behaviour is determined from the internal representation of the problem. The dominant view underlying framing research draws on Prospect Theory. It is assumed that the decision problem is internally represented in terms of a gamble structure as weighted probabilities of gains and losses, and that this is transformed into action by summing the products of the subjective values of these gains and losses and weighted probabilities of outcomes associated with different choice alternatives, choosing the one with the greatest overall value.

A profile of participants' choices showing a preference for a risk-averse alternative when the positive version of the problem is presented, and for a risk-seeking alternative when the negative version of a task is presented, is taken as supporting evidence for the framing effect, whereas any other pattern of responses is taken as evidence against the effect. However, there are two important limitations with this interpretation that may help to explain previous inconsistencies in research findings. The first concerns how to interpret response profiles, and the second concerns how choice is determined when participants do not internally represent a decision problem in a gamble-like structure. We review these limitations in turn.

Reframing framing effects. Maule (1989) reported a study where participants generated a concurrent think-aloud protocol while completing the Asian Disease problem. He showed that some protocols contained only words and phrases associated with gaining or saving (in all cases from participants given the positively framed version of the task) and these individuals were risk averse, as predicted by Prospect Theory. Other protocols contained only dying or losing words and phrases (in all cases from participants given the negatively framed version of the task) and these participants were risk seeking. However, a third set of protocols contained both saving and losing words (from both positively and negatively framed version of the task) and for these individuals choice behaviour was independent of problem framing. Maule interpreted this failure to find the usual problem-frame dependent reversal of preference as evidence that participants in this third group had elaborated their decision frames (i.e., had modelled the outcomes from both reference points) and that this elaboration had eliminated the framing effect.

However, these findings demand further consideration. One possible interpretation is that individuals in this third group spontaneously framed and reframed the problem and this activity induced a new, bias-free internal representation of the problem, although it is not entirely clear what this

would involve. Kahneman and Tversky (1984) ruled out the possibility that this could be a canonical representation since it would require taking into account all outcomes of concurrent decisions. In all likelihood, this would exceed human computational abilities even with simple problems, therefore making this psychologically implausible. They also suggested that it was unlikely to be an actuarial representation. So, without a viable description of the nature of this bias-free representation, this interpretation cannot provide an explanation of the findings.

A second interpretation is that reframing allows a decision-maker to test the robustness of preferences from the different perspectives afforded by changing reference points (Fischhoff, Slovic, & Lichtenstein, 1980). However, as we indicated above, it is not at all clear how individuals would, at the moment of choice, resolve the differences in the preferences structures between the positively and negatively framed versions of a decision problem, rendering this explanation problematic.

A third interpretation of the findings is that the participants in Maule's study switched between the two representations, in a similar manner to the switching of perspectives that occurs when people are presented with ambiguous figures such as the Necker cube. However, at the moment of choice, one of these would be predominant and it is this representation that would determine choice behaviour. For example, if the positive frame was predominant at the moment of choice then participants would be risk averse. From this interpretation, the relationship between a participant's internal representation and their choice behaviour is consistent with predictions from Prospect Theory—what does not hold is the relation between problem framing and the internal representation at the moment of choice. Previous failures to distinguish properly between problem framing and a decision-maker's internal representation of the problem has led most researchers to interpret a failure to find the predicted profile of choice responses as evidence against the notion of framing outlined in Prospect Theory. We believe that this may be an important error in interpretation that can only be clarified by maintaining a distinction between how the researcher frames the problem and the internal representation of that problem adopted by the decision-maker.

Our suggestion also challenges common assumptions that framing effects can be overcome by getting participants to frame a decision problem in different ways before making a choice (Arkes, 1991; Fischhoff et al., 1980) or getting them to "think harder". These instructions may simply decouple the internal representation of the problem from the way the problem is presented. However, once the individual has a preferred representation of the problem, the predicted profile of risk aversion in gains and risk seeking in losses may still occur. Simply showing that participants no longer show a reversal of preference across the positive and negatively framed versions of

the problem is not sufficient to show that debiasing of the effect has taken place. Future research needs to be sensitive to possible differences between the problem as presented and the problem as represented by the decision-makers, particularly the representation that predominates at the moment of choice. This will involve the development of techniques to assess directly decision-makers' internal representation of problems, rather than inferring them from the problem presented.

Several techniques have been used to capture participants' internal representations of decision problems. For example, Rettinger and Hastie (2003) used retrospective verbal protocols: having made a choice, participants were asked to write down in their own words the thinking that led to them to that choice, particularly the rules or procedures that would allow another person to think about the problem in the same way and make the same choice. As indicated above, Maule (1989) used concurrent protocol: participants said aloud all their thoughts while making their choice. In contrast to this, Maule, Hodgkinson, and Bown (2003) reported a study of framing effects in a complex strategic decision problem where internal representations were captured in terms of cognitive cause maps, drawn either before or after the research participants had made their choices (see also Hodgkinson et al., 1999). Maule et al. (2003) argued that causal mapping was an appropriate technique for capturing their participants' internal representations following suggestions by Mason and Mitroff (1981) that strategic decisions of this kind are commonly thought about causally. Groups of senior managers (working within the organisation used to develop the strategic problem) and business students judged their maps as being highly representative of how they had thought about the problem, thereby providing some support for the internal validity of this technique. However, there were differences between the cognitive maps of those drawing them prior to choice and those drawing post-choice, suggesting that the internal representation of a problem may change over time. This raises important conceptual issues about whether the final decision is based on just one or all of these different representations (discussed earlier when considering how elaboration affects decision framing). Also, these techniques only capture those elements of the internal representation that can be articulated. This constraint has two implications. First, any aspects of the internal representation that cannot be readily reported verbally are likely to be neglected even if they were critical in determining choice. Second, it is doubtful that people can report the editing processes involved in framing, only the outcomes of these processes. For example, in the analysis of concurrent verbal protocols reported by Maule (1989), participants were able to report the valence of their representation of the problem (i.e., whether they were thinking about gains or losses or both), but not the processes that gave rise to this (i.e., editing operations such as coding).

Further work is urgently needed to investigate the validity and reliability of these different methods.

The second important limitation with the assumption that framing effects are revealed by the observation of opposing choice patterns in gain- versus loss-framed problems relates to the determination of choice when participants do not internally represent a decision problem in a gamble-like structure. The Prospect Theory explanation of the transformation of an internal representation into choice behaviour is only appropriate for situations where this representation is in a gamble-like form. As discussed above, there is increasing evidence that gamble-like structures are only one of several ways in which decision problems are internally represented, suggesting that we need a broader view of the evaluation operations involved. For example, if a decision problem is represented causally then quantitative operations of evaluation of the kind assumed by Prospect Theory are no longer applicable. Rettinger and Hastie (2003) suggested three broad sets of evaluation operations: *arithmetic calculations* (e.g., prospect valuations or expected utility considerations), *narrative scenario evaluation* (e.g., integration of causal maps or networks linking participants' knowledge and elements of the problem text; see also Kintsch, 1998), and *focus reaction* (e.g., focusing on outcomes or affect). According to the authors, the choice may result from the application of one or more of these evaluation operations. The resulting combination of these operations, or *decision strategy*, applied to the representation would then depend on the content of the problem as well as other factors.

Based on an analysis of written protocols on the rules or procedures participants reported using after having made their choice, Rettinger and Hastie (2001) indeed observed that there were seven such decision strategies: *numerical calculations*, *emotional reaction*, *story construction*, *regret focus*, *morality focus*, *best outcome focus*, and *worst outcome focus*. Their results showed that different scenario contents led not only to different choices but also to different decision strategies. Thus, the majority of participants reported focusing on avoiding the worst outcome in gambling situations, whereas most reported making numerical computations in a situation where they had to choose whether to keep or sell stocks or when they had to choose between writing a paper or taking a final exam. In contrast to this, choices in the legal domain where primarily made on moral grounds. In addition to the effect of content on the decision strategy used, the authors proposed that the decision strategies applied to a task vary as a function of both personal factors (*personal importance* and *familiarity*), and situational factors (*outcome duration* and *moral relevance*). For example, personal importance is presumed to lead to deeper, more demanding narrative processing which increases the likelihood that participants' internal

representations will include information about mores, values, and social pressures, rather than being simple and gamble-like.

In sum, the general theoretical framework proposed by Rettinger and Hastie is broadly consistent with our view that there is a need to explain how the internal representations of framing problems are transformed into choice behaviour. However, there are several outstanding issues to be resolved. Preliminary results from Rettinger and Hastie (2000) suggest that adding a rationale for the options presented in the Asian Disease problem can affect the decision strategies used to solve the problem, and hence the option chosen. However, these results also reveal that framing itself does not have an effect on the decision strategies used. This rather surprising result also points to the limits of our current knowledge: it suggests that choice behaviour results from both the way in which information is presented *and* the decision strategy used to make a choice. But if external framing does not affect the decision strategies used, yet such strategies affect choice outcomes, what determines the decision strategy used? And why is external framing having an effect on the choice outcome? Perhaps the issue lies elsewhere, namely in the current account of evaluation operations performed on the problem representation. Rettinger and Hastie (2003) themselves recognised that their data indicate there is a correlation between the decision strategies reported and the choice behaviour observed. However, the effect of decision strategies on choice behaviours remains to be experimentally tested. Moreover, the link between the verbal description of these strategies and the elementary evaluation operations proposed (arithmetic; narrative-scenario evaluation, and focus reaction) is still rather qualitative. Further research will need to specify these evaluation operations in greater detail in order to explain how they interact with the task representation to determine choice.

CONCLUSION

This brief review has demonstrated a very rich stream of work on framing across a broad range of academic disciplines. The ideas developed by Daniel Kahneman, in conjunction with Amos Tversky, have been crucial in establishing a highly influential and important research agenda on framing and the framing effect in human decision making. Our informal literature search strategy revealed a large number of articles citing either or both of Tversky and Kahneman's (1981) and Kahneman and Tversky's (1984) papers, although we recognise that this may well underestimate the number of published studies on this topic.

However, it is of interest to note that in their initial formulation of framing, Kahneman and Tversky (1979) restricted themselves to choice problems "where it is reasonable to assume either that the original

formulation of the prospects leaves no room for further editing, or that the edited prospects can be specified without ambiguity'' (p. 275). While this was an appropriate restriction at the beginning of this stream of work, we contend that researchers have kept too closely to formulations of framing developed from this viewpoint, despite the fact that the range of decision problems investigated has become increasingly varied, and, in doing so, are likely to include situations where these restrictions no longer apply. In addition, we believe that the very strong focus on validating the framing effect has masked the more important issue of understanding how problems are framed, or internally represented by decision-makers. This point was recognised in an early definition of framing proposed by Kahneman and Tversky, where they stated that the frame is ''determined partly by the formulation of the problem and partly by the norms, habits and personal characteristics of the decision maker'' (Tversky & Kahneman, 1981, p. 453). However, it seems that much of the research generated since this seminal work has focused primarily on investigating the predicted relationship between the problem formulation and choice behaviour. If we are to understand decision framing, and explain the anomalies surrounding the framing effect, then future research must seek to explain how problems are internally represented by decision-makers and how choice behaviour is derived from these different representational schemes.

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