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# Predecisional Information Distortion and the Self-Fulfilling Prophecy of Early Preferences in Choice

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## Abstract

When a decision maker begins to favor a particular choice option, this tentative preference often shifts the evaluation of subsequent information in a manner that benefits the early leader. This ubiquitous bias, called *predecisional information distortion*, can create a form of self-fulfilling prophecy in which the decision maker is especially likely to choose the initially preferred option. Recent evidence has indicated that information distortion occurs in risky choices as well as riskless choices, that distortion also occurs in choices with more than two options, and that distortion can both enhance the leading option and degrade the trailing option(s). The effects of information distortion on choice and related variables are often sizable and cannot be attributed to individual differences in people's "undistorted" assessments of the information. Although several issues are not yet resolved, incorporating information distortion into theories and models of the choice process should be a high priority for decision science.

## Keywords

choice, coherence, decision making, information distortion, preference formation

When a physician is diagnosing a patient, information typically arrives sequentially. The patient's initial appearance and problem description lead to additional questioning and closer physical examination, perhaps followed by laboratory tests that the physician hopes will distinguish among the possible diagnoses. Similarly, a juror in a criminal trial must integrate a potentially complex stream of evidence to reach a verdict regarding the defendant's guilt or innocence. Consumers also make decisions based on sequential information, as when a moviegoer chooses between two or more films based on trailers, online reviews, and friends' comments. Although these examples differ in some respects, they are similar in that the decision maker develops and updates his or her opinion on the basis of new information over the course of the decision.

Because making good choices is important, it seems obvious that the decision maker should evaluate the available information in an unbiased manner. It is considered unwise, or at least sloppy, to distort new information so that it better fits one's current belief or preference. Despite this intuition, however, substantial research has demonstrated that people do bias their interpretations to

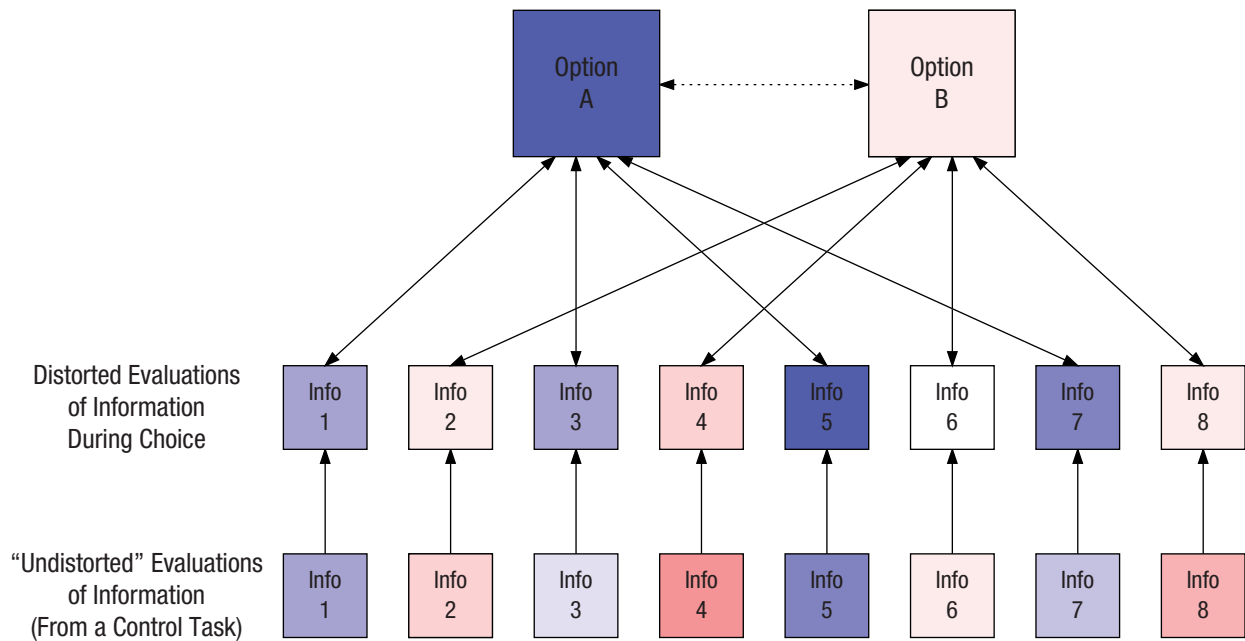
favor their emerging belief or preference. This bias is called *predecisional information distortion* (Russo, Medvec, & Meloy, 1996; Russo, Meloy, & Medvec, 1998). It appears to result from the decision maker's striving for a coherent (evaluatively consistent) view of the choice options and the relevant information (Russo, Carlson, Meloy, & Yong, 2008) and from automatic information-integration processes that also serve to increase coherence (Glöckner, Betsch, & Schindler, 2010; Holyoak & Simon, 1999; Simon, Pham, Le, & Holyoak, 2001; Simon, Snow, & Read, 2004). Information distortion is characteristic of a larger constellation of biased predecisional processes (Brownstein, 2003) and is consistent with extensive evidence showing that individuals typically construct rather than merely express their preferences (Lichtenstein & Slovic, 2006).

Empirical support for information distortion comes primarily from two research traditions. In one approach,

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**Fig. 1.** A simplified connectionist model of predecisional information distortion in a preference task. Options A and B could be apartments, for example, and information items could be the apartments' attributes (e.g., descriptions of their kitchens). Darker shading indicates more positive evaluations of options and information items (blue for Option A and pink for Option B). Solid lines indicate positive, excitatory associations that may be bidirectional. For example, not only does the evaluation of Info 3 affect the evaluation of Option A, but the evaluation of Option A also affects (distorts) the evaluation of Info 3, as indicated by the change in shading for that item. The dotted line between Options A and B indicates a negative, inhibitory relationship that is also bidirectional: The more one prefers Option A, the less one prefers Option B, and vice versa. (Additional inhibitory links between closely related information items or between an information item and an option may be appropriate in other judgment tasks, e.g., medical diagnosis.) The figure shows a possible state of the network near the end of the decision process. For a participant who encounters the information in a left-to-right order, Info 1 leads to an initial preference for Option A, which in turn distorts the evaluations of subsequent information in a self-reinforcing manner (darker blue and lighter pink, relative to the "undistorted" evaluations). Choosing Option A is the likely result. Considering the information in a different order (e.g., starting with Info 8) could lead to the opposite choice.

developed by Russo and colleagues, participants evaluate each new information item as it is presented and update their preferences before seeing the next item. Distortion is indicated by the finding that participants' current preferences predict their evaluations of the next information item. In a complementary approach developed by Simon and colleagues, participants evaluate information items before, during, and after a decision. Distortion (or a "coherence shift," in those authors' terms) is indicated by the finding that these evaluations come to support the ultimately chosen option more strongly as the decision progresses. Despite their myriad variations and subtleties, these approaches have yielded remarkably consistent results.

Figure 1 depicts a simplified connectionist network for modeling information distortion. The essential feature of such networks is that the links between the options (e.g., two apartments) and the related information items (e.g., descriptions of their kitchens) are *bidirectional*. Not only do evaluations of the information items affect the emerging evaluations of the options (as they should), but the emerging evaluations of the options also affect (distort) the evaluations of the information items. Unfortunately, most psychological models of choice incorrectly assume that influence is unidirectional, from evaluations of input

information to evaluations of options, rather than bidirectional. For example, prospect theory (Tversky & Kahneman, 1992), decision field theory (Roe, Bussemeyer, & Townsend, 2001), sequential sampling models (Ratcliff & Smith, 2004), and "fast and frugal" decision heuristics (Gigerenzer, Todd, & the ABC Research Group, 1999) all assume unidirectional influence and hence cannot account for information distortion and its effects. Connectionist models that include bidirectional links between information items and options stand out as exceptions to this generalization (Glöckner et al., 2010; Glöckner & Herbold, 2011; Hagmayer & Kostopoulou, 2013; Holyoak & Simon, 1999).

### The Ubiquity of Predecisional Information Distortion

Predecisional information distortion is a pervasive phenomenon, documented not only in medical decisions (Kostopoulou, Russo, Keenan, Delaney, & Douiri, 2012; Nurek, Kostopoulou, & Hagmayer, 2014), legal decisions (Carlson & Russo, 2001; Engel & Glöckner, 2013; Holyoak & Simon, 1999; Simon et al., 2001; Simon, Snow, & Read, 2004), and consumer decisions (Carlson, Meloy, & Russo,

2006; Russo et al., 2008; Russo et al., 1996; Russo et al., 1998) but also in employment, professional, entrepreneurial, and educational decisions (for additional references, see Miller, DeKay, Stone, & Sorenson, 2013; Russo, 2015). It occurs in choices between real goods (Carlson & Pearo, 2004) and for both experimentally manipulated and naturally emerging beliefs and preferences.

Information distortion is also relatively difficult to curtail. For example, it persists in the presence of monetary incentives for accuracy (Engel & Glöckner, 2013; Meloy, Russo, & Miller, 2006). In one successful debiasing effort, distortion was eliminated when participants considered detailed descriptions of the options' attributes and their levels prior to the choice task (Carlson & Pearo, 2004). In terms of Figure 1, this procedure limits distortion by more firmly establishing the "undistorted" evaluations of attribute information. Russo (2015) has described other countermeasures, both successful and unsuccessful.

This section highlights three additional advances. First, many findings regarding distortion in riskless choices (e.g., between backpacks) also extend to risky choices. For example, DeKay, Patiño-Echeverri, and Fischbeck (2009b) reported that participants considering personal and policy decisions involving risk (e.g., deciding whether to evacuate upon receiving a dam-failure warning) distorted new information about outcomes and probabilities in whichever direction favored their emerging preference. Similar results have been obtained for choices between monetary gambles (DeKay, Stone, & Miller, 2011; DeKay, Stone, & Sorenson, 2012; Glöckner & Herbold, 2011; Miller et al., 2013) and other risky prospects (DeKay, Patiño-Echeverri, & Fischbeck, 2009a; Miller et al., 2013; Russo & Yong, 2011). These studies and others (Simon, Krawczyk, & Holyoak, 2004) have also demonstrated that precise numerical information is routinely distorted.

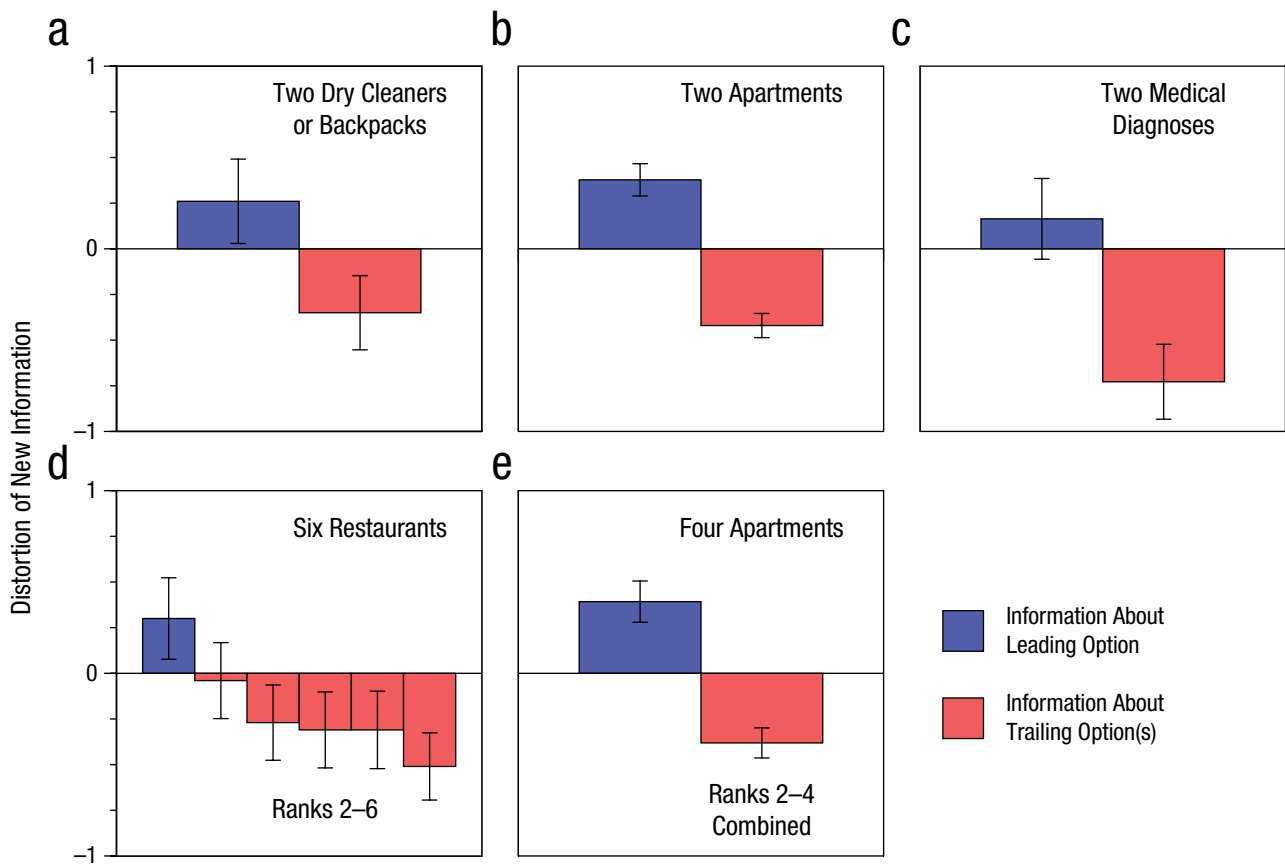
Second, information distortion can be decomposed into two components: positive distortion of information about the tentatively leading option, called *proleader distortion*, and negative distortion of information about the trailing option, called *antitrailer distortion*. In Figure 1, an emerging preference for Option A distorts information about that option positively (darker blue shading) and information about Option B negatively (lighter pink shading), with the antitrailer distortion resulting from the inhibitory link between the two options. Blanchard, Carlson, and Meloy (2014) and DeKay, Miller, Schley, and Erford (2014) found that proleader and antitrailer distortion were roughly symmetric in choices between two dry cleaners, backpacks, or apartments (see Figs. 2a and 2b). In Nurek et al.'s (2014) studies, however, physicians choosing between two diagnoses exhibited substantial antitrailer distortion but little if any proleader distortion (see Fig. 2c). The authors hypothesized that antitrailer distortion was more prevalent because physicians are

trained to rule out competing diagnoses or because they are especially cautious in accepting a leading diagnosis.

Third, people distort information not just in binary choices but also in choices with multiple options. This extension greatly increases the relevance of information distortion for consumer decision making, as well as for decisions in business, medicine, public policy, and other domains. When choosing among four apartments, DeKay et al.'s (2014) participants exhibited proleader and antitrailer distortion in roughly equal amounts, though the study did not assess distortion separately for each of the trailing apartments (see Fig. 2e). When choosing among six restaurants, Blanchard et al.'s (2014) participants exhibited positive distortion of information about the leading option, essentially no distortion for the second-ranked option, and increasingly negative distortion for lower-ranked options (see Fig. 2d). This orderly decrease may have resulted partly from participants' ranking the full set of options after learning about each attribute (arguably a somewhat unnatural task) rather than simply focusing on the most competitive options. Nonetheless, these results and those of Nurek et al. (2014) indicate that information distortion need not be symmetric or uniform.

## The Effects of Predecisional Information Distortion

Manipulating the order of information items so that participants are initially steered toward one option or the other has a substantial effect on their choices, even though all participants eventually see the same information (Carlson et al., 2006; DeKay et al., 2011; DeKay et al., 2012; Miller et al., 2013; Russo & Chaxel, 2010). This self-fulfilling prophecy of initial preferences—a form of primacy effect in which early information has undue influence on final choices—is mediated by the predecisional distortion of later information (DeKay et al., 2011; Miller et al., 2013). Similarly, Engel and Glöckner (2013) reported that assigning participants to the role of prosecutor or defense counsel in a criminal case affected participants' (incentivized) verdict predictions and that this effect was mediated by distorted interpretations of the evidence. Primacy effects are not universal, however: Studies involving physicians have found either recency effects (Nurek et al., 2014) or neither primacy nor recency effects (Kostopoulou et al., 2012). A possible methodological explanation for these anomalous results is that the initial three-item "steer" in these studies was followed by a single question regarding diagnostic likelihood, whereas the three opposing information items, which appeared much later, were presented separately and were followed by two or three questions each (six or nine questions in all, depending on the study). This difference in emphasis may have accorded the later information items greater influence on the final diagnosis.



**Fig. 2.** Positive distortion of information about the leading option (proleader distortion) and negative distortion of information about the trailing option(s) (antitrailer distortion) in studies involving two options (panels a–c) or multiple options (panels d and e). In these studies, distortion was assessed relative to mean “undistorted” evaluations from separate control groups. Original evaluations were on 9-point scales (panels a, b, d, and e) or 11-point scales (panel c, rescaled here to match the others). Error bars represent 95% confidence intervals for the means. Data are from Blanchard, Carlson, and Meloy (2014; a and d); DeKay, Miller, Schley, and Erford (2014, Study 2; b and e); and Nurek, Kostopoulou, and Hagmayer (2014, Study 1; c). Panel (d) is adapted from “Biased Predecisional Processing of Leading and Nonleading Alternatives,” by S. J. Blanchard, K. A. Carlson, and M. G. Meloy, 2014, *Psychological Science*, 25, p. 815. Copyright 2014 by the Association for Psychological Science. Adapted with permission. Panels (b) and (e) are adapted from “Proleader and Antitrailer Information Distortion and Their Effects on Choice and Postchoice Memory,” by M. L. DeKay, S. A. Miller, D. R. Schley, and B. M. Erford, 2014, *Organizational Behavior and Human Decision Processes*, 125, p. 140. Copyright 2014 by Elsevier. Adapted with permission.

Of course, people’s evaluations of relevant information would be expected to affect their choices even in the absence of information distortion. It is therefore useful to disentangle the effect of information distortion from the effect of people’s “undistorted” evaluations of the information items (undistorted by the consideration of specific choice options, that is). Individual differences in undistorted evaluations cannot account for the effect of information order on choice in the studies cited above because participants were randomly assigned to information orders. But what if participants’ early leanings are not manipulated? DeKay et al. (2014) provided strong evidence for the link between distortion and choice in such cases. Specifically, both proleader and antitrailer distortion predicted choice over and above the effect of the same participants’ undistorted evaluations, which were assessed in

a separate no-choice control task. DeKay et al. (2014) also analyzed identical information items that did not distinguish between the options (e.g., when two apartments both had “tasteful, newly renovated interiors”). Although participants’ undistorted evaluations should have been the same for identical items, participants still distorted the information to favor the tentative leader, and this distortion still predicted participants’ final choices.

Distortion also predicts other choice-related variables, such as participants’ final strength of preference (DeKay et al., 2011; DeKay et al., 2012), the difference between participants’ subjective monetary values for two alternatives (DeKay et al., 2012), participants’ final confidence in their verdicts (Simon, Snow, & Read, 2004), and physicians’ final and near-final judgments of diagnostic likelihood (Nurek et al., 2014). In DeKay et al.’s (2014) studies,

predecisional distortion also predicted participants' post-decision memories of the original information (attributes of apartments), with positive and negative distortions predicting corresponding memory errors.

The effects of information distortion can be sizable. For example, manipulating information order typically yields swings of 20 to 30 points (or more) in the percentage of participants choosing one option or the other (DeKay et al., 2011; Miller et al., 2013). Using U.S. dollars as the metric, DeKay et al. (2012) estimated the effects of distortion to be about 30% as large as the average value of the options in choices between monetary gambles. In other risky choices (e.g., responding to a dam-failure warning), evaluations of possible decision outcomes are sometimes distorted enough to imply falsely that one option is *always* better, regardless of the probabilities involved (DeKay et al., 2009a, 2009b). Distortion can also lead people to choose options that they otherwise judge to be inferior (Russo, Carlson, & Meloy, 2006).

## Outstanding Issues

There are several promising avenues for future research. For example, although choices among several options are commonplace outside the lab, only two studies have assessed the distortion of multiple options (Blanchard et al., 2014; DeKay et al., 2014). Blanchard et al.'s results (see Fig. 2d) raise a number of interesting questions. In particular, the increasingly negative distortion of information about the less attractive options appears consistent with coherence-based accounts, but it seems hardly worth the trouble if the goal is to choose the best alternative. Ideally, this issue can be studied without requiring participants to rank the options explicitly, though that may prove difficult. The absence of distortion for the second-ranked option is also intriguing. If the decision maker (or another party) winnows the field from several options to two, does distortion of the second-ranked option remain near zero, or does it become negative, as in decisions that start with only two options?

A second set of questions concerns the embedding of information distortion in the larger choice process. For example, even if the proximal effects of proleader and antitrailer distortion on final choices are roughly equal (DeKay et al., 2014), antitrailer distortion may still matter less if people focus their attention or information search on the leading option, as has been suggested (Carlson & Guha, 2011). Engel and Glöckner (2013) have explored these issues in legal decisions, finding that participants' assigned roles (prosecution or defense) affected information distortion but not information search. However, differences in search patterns were surely dampened by the task-appropriate requirement that participants read each piece of evidence at least once. Decisions in other

contexts or with more options may allow greater latitude for leader-based search processes.

Third, it is clear that predecisional information distortion and evaluative coherence should be added to the list of empirical findings (regarding, e.g., choice patterns, confidence judgments, and response times) that are used to evaluate and compare psychological models of choice. These additional criteria imply immediately that many of the most popular models need to be modified. As already noted, connectionist models that include bidirectional links between information items and options are currently distinctive in their ability to account for information distortion and its effects. Such models can (a) explain how information distortion leads to greater coherence (Glöckner et al., 2010; Holyoak & Simon, 1999; Simon et al., 2001; Simon, Snow, & Read, 2004), (b) describe choice patterns (and some other results) at least as well as other decision models when all information is presented simultaneously (Glöckner & Herbold, 2011; Glöckner, Hilbig, & Jekel, 2014), and (c) account rather naturally for primacy effects when information is presented sequentially (Hagmayer & Kostopoulou, 2013).

More work remains, however. For example, current implementations of connectionist models do not clearly differentiate between changes in information evaluation and changes in information weighting, both of which are known to occur (Simon, Krawczyk, & Holyoak, 2004). In addition, different authors structure and interpret their networks differently. In inference tasks, for example, Glöckner et al. (2010; Glöckner et al., 2014) located the subjective validity of the evidence in the information nodes, whereas Hagmayer and Kostopoulou (2013) located subjective validity in the links that connect the information nodes (the evidence) to the option nodes (the hypotheses). Structures and interpretations can also differ between inference tasks (Glöckner et al., 2010; Glöckner et al., 2014) and preference tasks (Glöckner & Herbold, 2011). While such diversity is unsurprising, and perhaps healthy, restructuring or generalizing connectionist models to provide a more systematic account of the choice process should be an important goal.

Finally, there is the question of rationality. Although numerous authors have argued that bidirectional reasoning is irrational or that it can lead to poor outcomes (DeKay et al., 2009a, 2009b; Engel & Glöckner, 2013; Russo, 2015; Russo et al., 2006; Russo & Yong, 2011; Simon, 2004), it could still be adaptive in some circumstances if it leads to faster, easier, good-enough decisions that are less likely to be reconsidered or regretted. This broader view of rationality acknowledges that choosing the option with the best combination of features is only one of several goals and constraints that decision makers typically consider. Information distortion may be especially beneficial in situations where early information is expected to be valid and

diagnostic rather than irrelevant or misleading, as when a potential moviegoer seeks a recommendation from his or her favorite film critic or from a friend with similar tastes. It may also help in situations where evaluatively similar features tend to co-occur, so that an option's attractiveness on one feature predicts its attractiveness on others. More generally, whether information distortion is helpful, harmless, or harmful may hinge on the fit between the decision process and the decision environment (Hogarth & Karelaia, 2007). Recent evidence from simulations has indicated that choices based on coherence-based processes like those underlying information distortion can mimic choices based on rational processes relatively well—better, in fact, than several competing decision strategies—in a variety of situations (Jekel, Glöckner, Fiedler, & Bröder, 2012). Although distortion could still foster unjustified confidence or a tendency to overpay for the chosen option, these results suggest that the consequences of bidirectional reasoning may not be as bad, or as frequently bad, as is commonly assumed.

## Concluding Remarks

Two decades of research on information distortion and its effects tell a consistent and compelling story: Once decision makers start to lean toward one option or another, they evaluate subsequent information in a manner that tends to reinforce their developing preference. This positive feedback loop increases the coherence between their preference and the information on which it is ostensibly based and increases the chance that their final choice will match their initial leaning. This self-fulfilling prophecy is not perfect, of course, but the influence on choice can be considerable. Although interesting questions remain, predecisional information distortion and its effects are widespread, robust, and well established. The phenomenon warrants inclusion as an essential feature in any theory or model that aspires to describe the choice process.

## Recommended Reading

- Brownstein, A. L. (2003). (See References). A thorough review of research on biased processes in decision making, including early research on predecisional information distortion.
- DeKay, M. L., Miller, S. A., Schley, D. R., & Erford, B. M. (2014). (See References). A recent empirical article that distinguishes between proleader and antitrailer distortion and establishes the effects of predecisional information distortion on choice and memory.
- Holyoak, K. J., & Simon, D. (1999). (See References). A classic empirical article that describes how subjective evaluations of choice options and related information become more coherent over the course of decision making and how these processes can be modeled in a connectionist framework.

Russo, J. E. (2015). (See References). A very recent and thorough review of research using Russo and colleagues' stepwise approach to assessing predecisional information distortion.

Russo, J. E., Carlson, K. A., Meloy, M. G., & Yong, K. (2008). (See References). An important empirical article that demonstrates the central role of coherence in predecisional information distortion.

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