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Running Head: DECISION FRAMING AND INFORMATION SEARCH

Selective exposure and decision framing: The impact of gain and loss framing on confirmatory information search after decisions

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Abstract

When people make decisions, they often prefer to receive information that supports rather than conflicts with their decision. To date, this effect has mainly been investigated in the context of decisions about gains, whereas decisions about losses have received less attention. Based on Prospect Theory, we expected information search to be differently affected by whether people previously have decided about gains or losses. Three studies have revealed that selectivity of information search is stronger after gain-framed rather than after loss-framed decision problems. An investigation of the underlying psychological processes revealed that gain decisions are made with increased subjective decision certainty (i.e. they are easier and less effortful to make), which in turn systematically increases confirmatory information search.

Key words: information search – selective exposure - gain framing - loss framing – decision-making – decision certainty

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Selective exposure to information (confirmatory information search) addresses the phenomenon that people tend to systematically prefer information that is consistent rather than inconsistent with their attitudes, standpoints, and decisions (Festinger, 1957; Frey, 1986; Jonas, Schulz-Hardt, Frey, & Thelen, 2001; Lundgren & Prislin, 1996). With regard to decision making, this phenomenon has been consistently shown for both individual (Fischer, Jonas, Frey, & Schulz-Hardt, 2005; Frey, 1986; Jonas et al., 2001; Jonas & Frey, 2003; Jonas, Graupmann & Frey, 2006), and group decision making (Schulz-Hardt, Frey, Lüthgens, & Moscovici, 2000; Schulz-Hardt, Jochims, & Frey, 2002), whereas the most important practical relevance lies in the fact that this tendency can severely jeopardize decision quality (Janis, 1982; Kray & Galinski, 2003). The present research investigates whether this tendency for confirmatory information search is differently affected by gain- vs. loss-framed decision problems.

Research on Confirmatory Information Search

To date, various situational variables that increase confirmatory information search have been identified, for example: strong commitment (Schwarz, Frey, & Kumpf, 1981), high choice (Frey & Wicklund, 1978), limited availability of information (Fischer et al., 2005), negative mood (Jonas et al., 2006), or sequential information presentation (Jonas et al., 2001). Selective exposure effects have been explained both by cognitive and motivational accounts: Dissonance theory – a purely motivational account - suggests that decision makers systematically prefer supporting information in order to reduce the aversive motivational state of dissonance (cf. Festinger, 1957; Frey, 1986; Jonas et al., 2001). From a more cognitive perspective, Schulz-Hardt, Fischer, and Frey (2007) suggested that information search is determined by subjective information quality. However, because decision makers can not evaluate information quality independently from their own standpoint (Ditto & Lopez, 1992; Ditto et al., 1998), and a priori decision-relevant knowledge (Kunda, 1990), consistent

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information receives a subjective quality advantage, and thus is systematically preferred in information search (see also Fischer et al., 2005).

Since most previous paradigms employed to investigate information search were designed to test theories, less emphasis was given to the ecological validity of these decision paradigms. Yet, one shortcoming of previous research on information search is that people have predominantly decided about gains or positively framed decision alternatives (e.g. which one of several positively described books or holiday trips they would prefer; e.g., Frey, 1981; Jonas & Frey, 2003; Jonas, Graupmann, & Frey, 2006). However, in real life decision-making, the focus often lies on risks and drawbacks of specific decision alternatives. In other words, people are frequently confronted with loss decisions or loss-framed decision scenarios, respectively. For example, individuals have to decide which of two products not to buy, or investment strategies might be described with regard to their risk of loosing money rather than the potential to make high gains. These possibilities of being confronted with negatively (loss) framed decision scenarios have not yet been addressed by research on biased information search. Derived from Prospect Theory (Kahneman & Tversky, 1979), which assumes that decision processes can be strongly influenced by whether people make decisions about gains or losses, we propose that gain- vs. loss-framed decision problems also fundamentally change the way in which people search for new decision-relevant information.

Decision Framing and Information Search

Kahneman and Tversky (1979) presented a significant theory on risky choice called Prospect Theory, which addressed the problem of gain and loss decision framing. Among the assumptions of the theory was the proposition that losses appear larger than gains; that is, losses are more averse in intensity than the pleasure derived from equal-sized gains. Simply shifting reference points can determine whether alternatives are viewed as a chance to compensate losses or as a chance to make gains. Tversky and Kahneman (1991) reviewed many experiments that demonstrated the effect of loss aversion, for example: loss framing

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increases risk taking in decision-making, or negotiators are less likely to reach an agreement when the attributes of bargaining are framed as losses rather than as gains (see also Kahneman, Knetsch, & Thaler, 1990; Kahneman & Tversky, 1979; Tversky & Kahneman, 1981).

How might gain vs. loss decision frames differently affect the search for new decision-consistent and decision-inconsistent information? We propose that subjective decision certainty is a crucial variable mediating the impact of decision frame on information search. This is supported by Schneider (1992) who argued that loss decision frames induce more conflict and thus decrease the decision certainty and subjective reliability of the own decision preference. Similarly, Dunegan (1993) suggests that negatively phrased decision alternatives may evoke more thorough evaluations in order to avoid failure in decision-making (see also Lopes, 1987). As a consequence of lowered decision certainty and increased fear of failure in loss-framing conditions, decision makers may be more careful and thus exert themselves to a greater extent when selecting additional decision-relevant information, which in turn should result in a more even-handed information search. Empirical support for our hypotheses is provided by Ditto et al. (1998) showing that decision makers exhibit more effortful cognitive analysis when faced with negative, unfavorable prospects. In a similar vein, Dawson, Gilovich, and Regan (2002) found that individuals with skeptical mindsets (induced by having participants to consider threatening task rules) are less prone to exhibit a confirmation bias in context of a Wason task. Finally, research by Denes-Raj and Epstein (1994) demonstrated that people display “careless” and irrational decision making with gambles in the domain of gains (i.e. they prefer a gamble of 7 chances out of 100 to win over 1 chance in 10), whereas this error is less pronounced in the domain of losses.

To summarize, we propose that decision makers in a gain (compared to a loss) frame are not too diligent in their decision-making (i.e. exert themselves less) and thus come rather easily to a tentative, snap decision that they are quite confident about (in terms of self-

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perception the decision was easy and thus appears to be highly valid). However, high decision certainty after preliminary decisions should systematically increase decision makers' reliance on information that fits to their subjectively highly valid position (i.e., consistent information). In contrast, if decision makers are in a loss frame, they are more careful and thus unwilling to make a snap decision (so the decision appears to be more difficult). As a result they experience less decision certainty, which, in turn, should finally lead them to be more careful and thus even-handed in their information search. The following experiments test this line of reasoning.

STUDY 1

The first study tests whether gain framed decision indeed lead to greater selectivity in information search and subjective decision certainty than loss framed decisions. We also tested whether this expected effect is mediated by differences due to subjective decision certainty.

Method

Participants and design. One hundred sixteen participants (59 female and 57 male, 16 to 52 years of age; $M = 28.90$, $SD = 7.74$) from Ludwig-Maximilians-University, Munich, and pedestrians in a pedestrian zone located near the university participated in this experiment. The experiment was based on a 2 (*decision framing:* gain vs. loss) x 2 (*type of decision*: probability-based vs. definite outcome) x 2 (*type of information:* consistent vs. inconsistent) factorial design with repeated measures on the last factor.

Material and procedure. Following previous research on framing effects (cf. Tversky & Kahneman, 1981), we used a decision paradigm on risky stock trading in which participants had to decide between a probability-based and a fixed outcome strategy; probabilities and expectancy values for both strategies concerning the decision outcome were modeled on the 'Asian disease' problem of Tversky and Kahneman (1981). Before participants were asked to make a preliminary decision on the probability-based or fixed

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outcome investment alternative, they received some general information about stock investments and then read the following passage: "An investor is facing the loss of 30,000 Euro (about $37,500) due to the falling price of his stock investments. To stop the escalation of losses, his bank has suggested two different investment strategies. In your opinion, which of the two strategies should the investor follow?" In the gain-framing condition, participants had to decide between Strategy A, which would result in 10,000 Euro (about $12.500) being saved, and Strategy B, which entailed a 1/3 probability that the entire 30,000 Euro would be saved, but a 2/3 probability that nothing would be saved. In the loss-framing condition, participants had to decide between Strategy A, which would result in the loss of 20,000 Euro (about $25.000), and Strategy B, for which there was a 1/3 probability that nothing would be lost but a 2/3 probability that the entire 30,000 Euro would be lost. After the preliminary decision for the probability-based or fixed outcome alternative (participants were told that they could revise their preliminary decision at the end of the experiment), participants indicated their subjective decision certainty[1] as well as subjectively experienced dissonance (Elliot & Devine, 1994).

Subsequently, participants were informed that additional information concerning the decision problem was available, and that this could help them to re-evaluate their preliminary decision and to reach an optimal final decision. The additional pieces of information were said to consist of twelve one-page statements written by former participants, half of them consistent and the other half inconsistent with their previous decision. Each statement was summarized by a main thesis of one sentence, indicating whether the corresponding article supported or contradicted the risky (probability-based) investment strategy (A) or the sure

[1] Participants were asked to what extent (a) they were sure that they had made the right choice, (b) they were satisfied with their decision, and to what extent (c) they identified with their decision. All variables were measured on a scale from 0 (*not at all*) to 10 (*definitely*). Since these three items were highly correlated (all r values between .44 and .73, all p values < .001), they were collapsed into a scale of decision certainty ($\alpha = .79$).

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(definite outcome) investment strategy (B)[2]. The participants could choose freely among the available articles and the within-subject dependent variable was the number of consistent and inconsistent pieces of additional information chosen (for some subsequent analyses we also used the confirmation bias, which is represented by the difference between the number of selected consistent and inconsistent pieces of information). After the information search the experiment was over and participants were debriefed.

Results and Discussion

Check for manipulation and interfering effects: First of all, participants' information search did not depend on the type of decision they made. Neither a main effect, $F < 1$, $p > .34$, nor an interaction with type of decision frame occurred, $F < 1$, $p > .37$. Information search also did not depend on participants' age or gender, all Fs < 1.21, all ps > .28. Furthermore, the classic framing effect on decision making could be replicated. Participants in the gain-framing decision context predominantly chose the fixed (definite) outcome ($N = 34$) rather than the probabilistic decision alternative ($N = 18$), whereas participants in the loss-framing decision context predominantly preferred the probabilistic ($N = 42$) to the definite outcome decision alternative ($N = 17$), χ^2 (1, 114) = 16.98, $p < .001$. With regard to dissonance arousal, a one-way ANOVA revealed no significant main effect for gain vs. loss framing, $F(1, 114) = 0.01$, $p = .98$, $\eta^2 = .001$, indicating that participants felt a similar arousal of dissonance in the gain ($M = 2.12$, $SD = 1.35$) and loss framing condition ($M = 2.13$, $SD = 0.98$). Hence, it is unlikely that subsequent results are due to differences in dissonance arousal.

Information search. Cell means and standard deviations for the chosen consistent and chosen inconsistent articles as well as for the confirmation bias are shown in Table 1. A 2 (decision framing) x 2 (type of decision) x 2 (type of information) analysis of variance

[2] An example of a main thesis in favor of the sure (definite outcome) investment strategy (A) was: "The implementation of investment Strategy A would be a good decision." An example of a main thesis conflicting with the sure (definite outcome) investment strategy (A) was: "One should be careful with investment Strategy A". Similar expressions were used for information supporting or contradicting the risky (probability-based) investment strategy (B).

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(ANOVA) with repeated measures on the last factor revealed a significant main effect for the within-factor 'type of information', $F(1, 112) = 14.90$, $p < .001$, $\eta^2 = .12$, indicating that participants selected more consistent than inconsistent pieces of information. More important for our hypotheses, this main effect was qualified by a significant two-way interaction between 'type of information' and 'type of framing', $F(1, 112) = 6.70$, $p = .01$, $\eta^2 = .06$. In the case of gain framing, participants selected more consistent than inconsistent articles, $F(1, 55) = 13.55$, $p = .001$, $\eta^2 = .20$. In contrast, in the case of loss framing, there was no significant difference between selected consistent and inconsistent articles, $F(1, 59) = 1.74$, $p = .19$, $\eta^2 = .03$.

Decision certainty. A one-way ANOVA with decision certainty as the dependent variable revealed a significant main effect, $F(1, 114) = 13.92$, $p = .001$, $\eta^2 = .11$, indicating that participants in the gain-framing condition ($M = 7.21$, $SD = 2.34$) felt more certain about the validity of their decision preference than participants in the loss-framing condition ($M = 5.63$, $SD = 2.20$).

Mediational analysis. In the following analysis (cf. Baron and Kenny, 1986), we tested whether the effect of gain vs. loss framing on biased information search (confirmation bias) was mediated by differences due to subjective decision certainty. First of all, a regression analysis revealed a significant regression weight for decision framing predicting the confirmation bias, $\beta = .23$, $t(114) = 2.49$, $p = .01$. Second, decision framing also significantly predicted the expected mediator 'decision certainty', $\beta = .33$, $t(114) = 3.73$, $p = .001$. Finally, both 'decision framing' and 'decision certainty' were used as predictors for the confirmation bias. The overall regression was significant, $R^2 = .30$, $F(2, 113) = 7.37$, $p = .01$. Decision certainty received a significant regression weight, $\beta = .20$, $t(113) = 2.15$, $p = .03$, whereas the regression weight for decision framing decreased to $\beta = .16$ and was no longer significant, $t(113) = 1.68$, $p = .10$. A Sobel Test revealed that the regression weight of the independent

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variables (decision framing) marginally decreased when the mediator (decision certainty) was statistically controlled for ($Z = 1.88$, $p = .06$).

To summarize, Study 1 provided evidence that participants' information search is more biased after gain than after loss-framed decision problems. In addition, participants reported a higher sense of decision certainty in the gain rather than the loss-framing condition. Furthermore, a mediation analysis revealed that the effect of gain and loss decision framing on biased search was partially mediated by differences due to decision certainty.

STUDY 2

The next study was designed to replicate the findings of the preceding study with another decision paradigm and to make a stronger point about the causal role of decision certainty when accounting for the framing effect. Although mediation analyses suggested that decision certainty mediates the impact of decision framing on information search, these analyses are correlational in nature and thus can not definitely determine cause and effect in this relationship. In order to test whether a specific variable mediates a causal relationship the expected mediator can be directly manipulated. Thus, in Study 2 (besides gain and loss decision framing), we directly manipulated decision certainty and subsequently measured the preference for decision-consistent and decision-inconsistent pieces of information. If the framing effect is indeed based on differences due to subjective decision certainty, then artificially inducing high decision certainty should result in increased confirmatory information search independent from the induced decision frame.

Method

Participants and design. Seventy participants (34 female and 36 male, 16 to 56 years of age; $M = 24.34$, $SD = 7.80$) from Ludwig-Maximilian-University, Munich, participated in this experiment. The experiment was based on a 2 (*decision framing:* gain vs. loss) x 2 (*certainty induction*: yes vs. no) x 2 (*type of information:* consistent vs. inconsistent) factorial

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design with repeated measures on the last factor (the last within factor 'type of information' represents the dependent variable).

Material and procedure. The procedure in Study 2 was nearly identical to the previous study with the exceptions that we (a) used a German translation of the classic Asian disease paradigm (Tversky & Kahneman, 1981) and (b) directly manipulated decision certainty after participants' preliminary decision. After participants individually enrolled in the experimental lab, they were given a questionnaire that asked them to imagine that Germany was preparing for an outbreak of a dangerous Asian disease that was forecast to kill 600 people. Two alternative medical programs to combat the disease had been proposed. Participants were informed that the exact scientific estimates of the consequences of the programs were as follows: *Gain Frame:* (1) if Program A is adopted, 200 people will be saved; (2) if Program B is adopted, there is a 1/3 probability that 600 people will be saved and a 2/3 probability that no one will be saved; *Loss Frame:* (1) if Program A is adopted, 400 people will die; (2) if Program B is adopted, there is a 1/3 probability that no one will die and a 2/3 probability that 600 people will die. In addition, participants were informed that this decision problem had one correct solution. After participants were asked to make a preliminary decision, half of the participants were told that previous studies had revealed that normally more than 80 percent of participants make a correct decision and thus select the right medical program. The other half of participants received no such extra information. Subsequently, as a manipulation check of decision certainty was carried out[3].

Next, participants had the chance to read and select eight pieces of additional information (two supporting and two conflicting with medical Program A; two supporting and two conflicting with medical Program B). Thus, four additional pieces of information

[3] Participants indicated on a scale from 1 (*not at all*) to 10 (*definitely*) to what extent they were sure that their decision was correct, to what extent their decision was final, and to what extent their decision was still in progress. Because all three items were highly correlated (r values ranging from .47 to .56, all p values < .001), they were collapsed to a scale of decision certainty ($\alpha = .76$). The latter two variables (finality of decision, decision in progress) were assumed to be even more strongly related to decision certainty than the additional variables (identification and satisfaction with the decision) used in Study 1.

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supported the participants' preliminary decision and four pieces of information conflicted with it[4]. After the information search participants made a final decision, were informed about the aim of the experiment, thanked for their participation, and dismissed.

Results and Discussion

Check for manipulation and interfering effects. Of the 70 participants, three had to be excluded from further analyses because of missing values in the dependent variable information search. Therefore, 67 participants remained for the following analyses. Selectivity of information search was not significantly associated with participants' age or gender (all *F*s < 1). Type of preliminary decision was significantly associated with the confirmation bias (i.e. participants who chose the sure alternative exhibited a stronger confirmation bias, $M = 0.87$, than those who chose the risky alternative, $M = -0.25$, F [1, 59] = 4.60, $p < .04$), but did not interact with type of decision frame, $F < 1.25$, $p > .26$, nor with the certainty induction, $F < 1.11$, $p > .30$. There also was no three-way interaction, $F < 1$, $p > .63$. Thus, type of decision is not supposed to be confounded with the experimental design. In addition, we replicated the classic effect of framing on decision-making (cf. Tversky & Kahneman, 1981) only for the control (gain frame/sure alternative: $N = 11$; gain frame risky alternative: $N = 6$; loss frame/sure alternative: $N = 4$; loss frame/risky alternative: $N = 13$; χ^2 [1, 34] = 5.85, $p < .02$], but not for the high certainty conditions. With regard to subjective decision certainty, participants in the gain frame condition reported higher subjective decision certainty ($M = 6.28$, $SD = 1.90$) than participants in the loss frame decision ($M = 5.30$, $SD = 1.98$), $F(1, 63) = 4.66$, $p = .04$, $\eta^2 = .07$. Furthermore, participants with certainty induction reported higher subjective decision certainty ($M = 6.29$, $SD = 1.78$) than those with no certainty induction ($M = 5.23$, $SD = 2.07$), $F(1, 63) = 5.31$, $p = .03$, $\eta^2 = .08$. To summarize, the manipulation of decision certainty was successful.

[4] An example of a piece of information supporting medical Program A is: "One should select medical Program A because it is supposed to have the fewer harmful side effects." An example contradicting medical Program B was: "One shouldn't start medical program B because it is less effective with very young and very old people"

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Information search. Means and standard deviations are depicted in Table 2. Firstly, a significant two-way interaction between type of information and decision frame, $F(1, 63) = 11.39$, $p < .01$, $\eta^2 = .15$. Follow-up analyses revealed that overall, participants in the gain-framing conditions significantly preferred consistent ($M = 2.63$, $SD = 1.13$) to inconsistent pieces of decision-relevant information ($M = 1.81$, $SD = 1.12$), $F(1, 31) = 10.42$, $p < .01$, $\eta^2 = .25$. In contrast, a more balanced preference for consistent ($M = 2.03$, $SD = 1.25$) over inconsistent pieces of information ($M = 2.26$, $SD = 1.12$) was found in the loss-framing conditions, $F < 1$, $p > .35$. Secondly, a significant two-way interaction between 'decision certainty' and 'type of information', $F(1, 63) = 8.49$, $p < .01$, $\eta^2 = .12$. Follow-up analyses revealed that participants with high certainty induction exhibited a significant preference for consistent ($M = 2.68$, $SD = 1.07$) over inconsistent pieces of information ($M = 1.94$, $SD = 1.13$), $F(1, 33) = 11.53$, $p < .01$, $\eta^2 = .26$. In contrast, no significant difference between selected consistent ($M = 1.94$, $SD = 1.27$) and selected inconsistent pieces of information ($M = 2.15$, $SD = 1.15$) occurred without an additional certainty induction, $F < 1$, $p > .46$.

Most important for our hypotheses about the underlying psychological mechanism, we found a significant three-way interaction between decision frame, decision certainty, and type of information, $F(1, 63) = 8.49$, $p < .01$, $\eta^2 = .12$. Given no extra certainty induction, we observed a significant two-way interaction between decision frame and type of information, $F(1, 31) = 19.11$, $p < .001$, $\eta^2 = .38$, indicating that participants in the gain frame condition marginally preferred consistent over inconsistent articles, $F(1, 15) = 4.35$, $p = .055$, $\eta^2 = .23$; in contrast, participants in the loss-framing condition significantly preferred inconsistent over consistent articles, $F(1, 16) = 22.86$, $p < .001$, $\eta^2 = .59$. However, differences in selectivity between gain- and loss-framed decision contexts vanished when high decision certainty was induced. Accordingly, for the conditions with high decision certainty induction, no interaction occurred between decision frame and type of information, $F(1, 32) = 0.11$, $p > .74$, $\eta^2 = .01$.

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To summarize, Study 2 replicated the framing effect of Study 1; that is, decision makers exhibited a stronger confirmation bias in the context of gain- rather than loss-framed decision problems. Moreover, Study 2 further supported the assumption that subjective decision certainty plays an important role in explaining this effect: when participants received feedback that it was very probable that their decision was correct (cue for high decision certainty), a confirmation bias occurred for both the gain- and the loss-framed decision problem.

A shortcoming of the previous two studies is that the two factors 'decision framing' and 'type of decision' are not independent because gain framing compels most people to choose a risky strategy, whereas loss framing motivates people more strongly to choose the safe strategy. This confounding could represent a problem for the interpretation of our data because participants somehow self-selected their level on the factor 'type of decision'. To rule out this possible confounding, in the next study we employed another type of decision case and framing manipulation, which did not force the participants to choose between a decision alternative with a probabilistic (risky) vs. definite (sure) outcome.

STUDY 3

The last study aims (a) to replicate the framing effect of the previous studies with an alternative, less confounded, more realistic and involving decision scenario, (b) to shed further light on the psychological processes underlying the effect of decision framing on information search (i.e., whether decision makers exert themselves more in the context of loss rather than gain frames), and (c) to extend the framing effect to the assessment of information quality (which is a variable that is closely tied to information search; see Fischer et al., 2005; Schulz-Hardt, Fischer, & Frey, 2007).

Method

Participants and design. One hundred five participants (60 female and 45 male, 19 to 32 years of age; $M = 23.31$, $SD = 3.13$) from Ludwig-Maximilians-University, Munich,

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participated in this experiment. Participants in a social psychology class were asked if they would be willing to participate in a study on economic decision-making and market research. The experiment was based on a 2 (*decision framing*: gain vs. loss) x 2 (*type of information*: consistent vs. inconsistent) factorial design with repeated measures on the last factor (the last within factor 'type of information' represents the dependent variable).

Material and procedure. When participants arrived at the experimental lab, they were informed that they were to participate in a market research study investigating the product image of chocolate bars and cereal bars. Accordingly, in the gain condition they were asked to make a preliminary decision on whether they wanted to test and eat a chocolate or a cereal bar. In contrast, in the loss condition, participants had to decide which of the two—chocolate or cereal bar—they did not want to test and eat. Please note that both products were physically present. Participants were told that they could revise their preliminary decision at the end of the experiment. After the preliminary decision concerning gain or loss of a chocolate or cereal bar, the experimenter either gave them the selected bar (gain condition) or took away one of the two bars (loss condition).

Next, participants were given the chance to gather additional information concerning their decision. These additional pieces of information were statements by experts on consumer goods (such as chocolate and cereals bars) and were presented in the form of main arguments (as in the previous two studies). In both conditions participants were faced with eight pieces of information, half of which supported and half of which conflicted with their preliminary gain or loss decision. An example of an argument supporting the consumption of the cereal bar was: "One should eat cereal bars because they are very healthy for the bowels." In contrast, an example of a piece of information conflicting with the decision to eat the cereal bar was: "Cereal bars do not taste nice. Thus, one shouldn't eat them." Similar arguments were employed for chocolate bars.

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First of all, participants evaluated information quality with regard to its credibility and importance for the final decision (for both items on the following scale: 0 = *not at all*; 10 = *definitely*)[5], and subsequently decided whether they wanted to read the information in more detail or not. Participants were allowed to select freely among the available pieces of information (0–8). After the information search, participants made their final decision and answered to what extent they had exerted themselves in the study (0 = *not at all*; 10 = *very much*). Subsequent to the exertion measure, as in Study 1 participants answered questions concerning dissonance arousal in order to control whether dissonance processes are relevant for the expected effect (Elliot & Devine, 1994). Finally, participants were informed about the hypotheses of the experiment, thanked for their participation, and dismissed.

Results and Discussion

Check for interfering effects: The confirmation bias was not significantly associated with participants' age, gender or preliminary decision, all F values < 1. In addition, no interactions occurred between the participants' preliminary decision and the experimental factor, $F < 1$. With regard to dissonance processes, a one-way ANOVA revealed no significant main effect for the factor decision framing, $F(1, 115) = 1.22$, $p = .27$, $\eta^2 = .01$, indicating that no differences in dissonance arousal levels occurred as a function of whether participants made a gain ($M = 2.64$, $SD = 0.89$) vs. a loss decision ($M = 2.84$, $SD = 1.08$).

Information search. Cell means and standard deviations are shown in Table 3a. A 2 (decision framing) x 2 (type of information) ANOVA with repeated measures on the last factor revealed a significant main effect for type of information, $F(1, 103) = 4.49$, $p = .04$, $\eta^2 = .04$, indicating that in general participants selected more consistent than inconsistent articles. Moreover, this interaction was qualified by a significant two-way interaction between decision framing and type of information, $F(1, 103) = 4.49$, $p = .04$, $\eta^2 = .04$. In the case of

[5] Since the credibility bias (credibility of supporting minus credibility of conflicting pieces of information) and importance bias (see credibility bias) were highly correlated ($r = .41$, $p < .01$), both quality dimensions were collapsed into a scale of information quality ($\alpha = .59$).

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gain decisions, participants significantly preferred consistent to inconsistent articles, $F(1, 49) = 8.01$, $p = .01$, $\eta^2 = .14$. In contrast, in the case of loss decisions, there was no significant difference between selected consistent and inconsistent articles, $F < 0.1$.

Information evaluation. Cell means and standard deviations are shown in Table 3b. A 2 (decision framing) x 2 (type of information) ANOVA with repeated measures on the last factor revealed a significant interaction, $F(1, 103) = 6.16$, $p = .02$, $\eta^2 = .06$. Participants deciding about gains expected consistent articles to be of higher quality than inconsistent articles, $F(1, 49) = 14.89$, $p = .001$, $\eta^2 = .23$. In contrast, after loss decisions, participants did not indicate a different perceived quality for consistent and inconsistent articles, $F(1, 54) = 0.78$, $p = .38$, $\eta^2 = .01$.

Exertion. A one-way ANOVA revealed a significant main effect for decision framing, $F(1, 115) = 6.17$, $p = .01$, $\eta^2 = .05$. Participants in the loss-framing condition ($M = 6.23$, $SD = 2.24$) reported that they had exerted themselves more in the study than participants within the gain-framing condition ($M = 5.16$, $SD = 2.44$).

GENERAL DISCUSSION

The present research investigated the effects of gain- and loss-framed decision problems on the search for new decision-relevant information. Our results suggested that loss-framed decision problems are accompanied by a systematically lower confirmation bias in information search (Studies 1-3) and information evaluation (Study 3) than gain-framed decision problems. In addition, we were able to elucidate some underlying psychological processes: participants exposed to a gain decision frame exerted themselves less (Study 3) and thus experienced higher subjective decision certainty (Studies 1-2) than participants exposed to a loss decision frame. This increased decision certainty, in turn, led to increased confirmatory tendencies in information evaluation and search.

Implications, Limitations, and Future Research

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From a theoretical perspective, our study revealed that it was a fruitful endeavor to combine research on Prospect Theory with research on biased information search. In the context of Prospect Theory, many studies have investigated the effects of gain and loss framings, for example, on risk taking (Kahneman & Tversky, 1981), willingness to buy (Zhang & Buda, 1999), or attractiveness of consumer goods (van Dijk & van Knippenberg, 1998). However, none of this research investigated possible differential effects of gain and loss framings on biased information search, which is an important process that precedes decision-making and determines the quality of decision outcomes (Kray & Galinski, 2003; Nemeth & Rogers, 1996).

On a practical level the most important implication of our results concerns the question of how to formulate a decision problem in order to obtain a balanced or self-critical information search, which has been shown to lead to the best decision outcomes (Kray & Galinski, 2003). Since gain decisions are associated with a stronger selectivity in information search than loss decisions, we must state that decision quality could be negatively affected when decision makers focus too intently on gains rather than associated losses. As a consequence, in real life contexts, (such as decision-making in business or politics) one should be careful not to formulate decision problems exclusively as gain decisions: decision-related losses should not be suppressed.

A limitation of our research is that two out of the three decision scenarios employed are statistical abstractions without any real consequences. Hence, the question arises whether similar choices and information search tendencies would occur in real life decision-making (e.g. when medical staff has to decide in reality how to save the population from disease). Future research should address this point and employ more realistic decision scenarios with real consequences for the decision makers.

Finally, in two out of three studies the effect of decision framing on information search is mainly due to a change in the selection of inconsistent pieces of information. Only in

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Study 1 is the effect mainly due to consistent pieces of information. Although this inconsistency does not change the main message of the present article (i.e. gain frames increase confirmatory tendencies in information search processes), future research should address the question under what conditions does framing lead to a neglect of inconsistent information or an overrepresentation of consistent information in information search.

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Table 1:

Means and standard deviations for information search as a function of experimental conditions in Study 1.

	Type of information					
	Consistent[a]		Inconsistent[a]		Confirmation bias[b]	
Experimental condition	*M*	*SD*	*M*	*SD*	*M*	*SD*
Gain framing (*N* = 56)	2.71	1.99	1.57	1.73	1.14*	2.32
Loss framing (*N* = 60)	2.00	1.08	1.75	1.72	0.25	1.47

Note.

[a] Six statements were available in each category.

[b] The "confirmation bias" corresponded to the difference between the number of chosen consistent and the number of chosen inconsistent statements.

* $p < .05$ (t-test against zero)

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Table 2:

Means and standard deviations for information search as a function of experimental conditions in Study 2.

	Type of information					
	Consistent[a]		Inconsistent[a]		Confirmation bias[b]	
Experimental condition	*M*	*SD*	*M*	*SD*	*M*	*SD*
Gain framing/no induction (*N* = 16)	2.25	1.18	1.44	1.03	0.81+	1.56
Loss framing/no induction (*N* = 17)	1.65	1.32	2.82	0.81	-1.17*	1.01
Gain framing/certainty induction (*N* = 16)	3.00	0.97	2.19	1.11	0.81*	1,33
Loss framing/certainty induction (*N* = 18)	2.39	1.09	1.72	1.13	0.67*	1.24

Note.

[a] Four statements were available in each category.

[b] The "confirmation bias" corresponded to the difference between the number of chosen consistent and the number of chosen inconsistent statements.

+ $p < .10$ (t-test against zero)

* $p < .05$ (t-test against zero)

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Table 3a:

Means and standard deviations for information search as a function of experimental conditions in Study 3.

	Type of information					
	Consistent[a]		Inconsistent[a]		Confirmation bias[b]	
Experimental condition	*M*	*SD*	*M*	*SD*	*M*	*SD*
Gain decision (*N* = 56)	1.68	1.36	1.20	1.34	0.48*	1.20
Loss decision (*N* = 60)	1.62	1.21	1.61	1.19	0.01	1.12

Note.

[a] Four statements were available in each category.

[b] The 'confirmation bias' corresponded to the search differences between the number of chosen consistent and the number of chosen inconsistent additional information.

* $p < .05$ (t-test against zero)

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Table 3b:

Means and standard deviations for information evaluation as a function of experimental conditions in Study 3.

	Type of information					
	Consistent		Inconsistent		Evaluation bias[a]	
Experimental condition	*M*	*SD*	*M*	*SD*	*M*	*SD*
Gain decision (*N* = 56)	5.28	1.86	4.16	1.30	1.12*	2.04
Loss decision (*N* = 60)	4.76	1.36	4.56	1.36	0.20	1.71

Note.

[a] The 'evaluation bias' corresponded to the evaluation differences between consistent and inconsistent pieces of additional information.

* $p < .05$ (t-test against zero)

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