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Framing zero: Why losing nothing is better than gaining nothing

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ABSTRACT

The framing of zero has a substantial effect on judgment and decision-making, a fact which is often ignored or unacknowledged by many authors. Although prior research has shown that zero carries a special meaning, no prior research has specifically examined the framing of zero. Across four studies, the current research demonstrates the effect the framing of zero has on judgment and decision-making and explores the underlying mechanisms. In the context of a simple gamble a small loss is *more* attractive than gaining nothing, but the same small loss is *less* attractive than losing nothing. The present studies test and support an explanation of these findings based on the concept of reference points and the affect heuristic. The framing of zero in these decision problems acts as a point of comparison, or reference point, affecting how evaluators feel about the bet. These results establish the importance of framing zero in judgment and decision-making and sheds light on the mediators of this effect.

1. Introduction

Imagine being offered the following bet: A 20% chance to gain $9 and an 80% chance to gain nothing. Would it make a difference if zero was framed as *lose* nothing instead of *gain* nothing? Further, would the same bet be more or less attractive if you stood to lose 5¢?

Previous research has found that zero carries a special meaning in judgment and decision-making across a number of different contexts including work ethic, price, product attributes and choice (Gneezy & Rustichini, 2000; Magen, Dweck, & Gross, 2008; Palmeira, 2010; Shampanier, Mazar, & Ariely, 2007; Zhang & Slovic, 2019). For example, Gneezy and Rustichini (2000) found that participants worked harder for zero compensation than for a low amount of compensation, and Zhang and Slovic (2019) found that participants expressed a preference for options offering the possibility of either no one dying or no money being lost, over options with better expected values. These studies establish the importance of zero in judgment and decision-making. However, none of these studies specifically examined the framing of zero.

The present research seeks to fill this gap by examining the framing of zero across four studies. First, we replicate problem 3 and problem 4 from Tversky and Kahneman (1986) and study 1 from Bateman, Dent, Peters, Slovic, and Starmer (2007) and vary the framing of zero. In both cases we find that changing the framing of zero substantially affects the results of these studies. Second, we show in a simple gamble that while a small loss is *more* attractive than gaining nothing, the same small loss is *less* attractive than losing nothing. Third, we find that the differences between gaining nothing, losing nothing, and a small loss are mediated by positive affect, thus supporting previous research on the role of affect in framing (Kahneman & Frederick, 2007). Further, we demonstrate the differences between gaining nothing, losing nothing, and a small loss are explained by a combination of reference points and the affect heuristic (Slovic, Finucane, Peters, & MacGregor, 2002). In these decision problems the framing of zero acts as a reference point which affects the valence and salience of other parts of the bet in evaluating overall bet attractiveness. In other words, the framing of zero acts as a point of comparison affecting how evaluators feel about the probabilities and amounts which make up the other parts of the bet, and how much weight they are given in evaluating the overall bet.

This research makes a number of contributions. First, by showing that the results obtained in Tversky and Kahneman (1986) and Bateman et al., (2007) are dependent on the framing of zero, we are calling attention to the importance of how zero is framed in decision research. To be clear, this is not to say that the results of these studies are incorrect or less valuable. What we are saying is that since the framing of zero has such a significant impact on results, this fact should be acknowledged and controlled for in future studies. Thus, a major contribution of our work is to call attention to the effect different frames of zero have on

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judgment and decision-making. Our second main contribution is demonstrating the mechanism by which the framing of zero effects judgment and choice. We show that in the context of a simple gamble, gain nothing is perceived negatively and acts as a reference point making other parts of the bet feel worse, whereas lose nothing is perceived positively and makes other parts of the bet feel better. We now briefly review Tversky and Kahneman (1986) and Bateman et al., (2007) before turning our attention to the literature on framing, affect, and reference points.

2. Conceptual Development and Theoretical Framework

2.1. *Tversky and Kahneman (1986) and Bateman et al., (2007)*

In their now seminal series of studies, Kahneman and Tversky delineate a number of choice problems which violate the rational model and provide the basis for prospect theory. In reference to the current study, problems 3 and 4 from Tversky and Kahneman (1986) include a zero value. In these problems' participants are presented with the following options:

Problem 3 (N = 126)	
Assume yourself richer by $300 than you are today. You have to choose between	
A. A sure gain of $100	(72%)
B. A 50% chance to gain $200 and a 50% chance to gain nothing	(28%)
Problem 4 (N = 128)	
Assume yourself richer by $500 than you are today. You have to choose between	
A. A sure loss of $100	(36%)
B. A 50% chance to lose nothing and a 50% chance to lose $200	(64%)

Note: Percentages are the results from the original study

The results of these problems demonstrate a number of key points. First, a greater proportion of participants select the risk-averse option in the gain frame and the risk-seeking option in the loss frame. Thus, demonstrating risk-aversion in the realm of gains and risk-seeking in the realm of losses. Second, these two problems violate description invariance whereby the framing of the problem leads to different choices. Third, variations in the amount of initial wealth had little or no effect on choice, thus suggesting that outcomes are assessed in terms of gains or losses rather than total wealth. Tversky and Kahneman (1981) theorize that information is encoded as positive or negative, depending on how the choice is framed, and this encoding affects the worth of the information based on prospect theory's value function.

Another decision problem which also incorporates zero comes from Bateman et al., (2007). Bateman et al., (2007) find that a bet with a 7/36 chance of winning $9 and a 29/36 chance of winning nothing is judged as *less* attractive than a bet with a 7/36 chance of winning $9 and a 29/36 chance of losing 5¢. Since win nothing is clearly better than lose 5¢, participants are displaying a preference for the dominated option. The authors attribute this effect to a combination of the affect heuristic (Slovic et al., 2002) and evaluability (Hsee, 1996). According to Bateman et al., (2007), "the payoff combination ($9, win nothing) is not evaluable, and that adding the 5¢ loss makes $9 'come alive with feeling' and causes it to become weighted in the judgment of attractiveness" (p. 373). To support this claim Bateman et al., (2007) report the result of a study in which participants provide affective ratings for parts of their bet. They find that the ratings of the $9 were higher in the lose $.05 condition in comparison with the win nothing condition. In reference to evaluability it is worth noting that in all of Hsee's (1996) studies, choice options are varied on two different attributes. For example, a music dictionary with 10,000 entries and no defects is preferred over a music dictionary with 20,000 entries and a torn cover, when evaluated independently. However, in the case of Bateman et al., (2007) there are only different levels of the same attribute (money) and only one attribute is varied (the downside of the bet). Thus, it is unclear exactly how evaluability is functioning in the context of Bateman et al.'s (2007) gamble.

2.2. *Framing, Affect, and Reference Points*

Framing effects are often explained in terms of dual process theory (Kahneman, 2003; Maheswaran & Meyers-Levy, 1990), such as the Heuristic Systematic Model (Chaiken, 1980) or System 1 and System 2 (Stanovich & West, 2000). In this view, framing effects arise from an emotional response where sure gains are particularly attractive and sure losses are particularly unattractive (Kahneman & Frederick, 2007). The key role of emotions in framing effects is underscored by a number of different studies. First, individuals who are either induced or predisposed to a heuristic processing style are especially influenced by framing, whereas those who are either induced or predisposed to systematic processing are not (McElroy & Seta, 2003). Second, incidental positive affect eliminates any framing effect, specifically by decreasing risk propensity in the loss frame (Cassotti et al., 2012) whereas sadness increases risk aversion in gains (Campos-Vazquez & Cuilty, 2014). Third, in risky choice framing problems such as Kahneman and Tversky's Asian disease problem, affect measured before the choice mirrors previous results and mediates the choice pattern of the framing effect (Stark, Baldwin, Hertel, & Rothman, 2017). Lastly, the effects of message framing have been linked to activation of parts of the brain often associated with emotion (De Martino et al., 2006) and increased skin conduction response–an index of emotional reactivity (De Martino et al., 2008). Together, these studies support the contention that the effects of message framing are highly contingent on emotional reactions.

Reference points or what "other stimuli are seen in relation to" (Rosch, 1975 p. 532) have a long history in psychology (Hoch & Loewenstein, 1991) and are an important component of prospect theory. According to prospect theory, losses and gains are defined in terms of changes from a neutral reference point or the status quo. However, reference points can come from a number of different sources including social comparisons and goals, and may not necessarily represent zero or the status quo (Higgins & Liberman, 2018). Further, within any one decision multiple reference points can be considered (Heiman, Just, McWilliams, & Zilberman, 2015; Kahneman, 1992). Reference points have been invoked to explain a number of phenomena including the endowment effect (Isoni, 2011; Weaver & Frederick, 2012). Specifically, buyers may focus on their own personal utility from the acquisition of the good in setting their willingness to pay, and sellers may use the market value as a reference point in determining their willingness to accept, thus accounting for the observed differences.

2.3. *Predictions*

In both Tversky and Kahneman (1986) and Bateman et al., (2007), we contend that the framing of zero is partially responsible for the observed results. We predict that in the context of these decision problems gain nothing has a negative effect whereas lose nothing has a positive effect. Thus, in problem 3 from Tversky and Kahneman (1986) if the framing of zero is changed to lose nothing a greater proportion of participants will select the risk-seeking option whereas in problem 4 if the framing of zero is changed to gain nothing a greater proportion of participants will select the risk-averse option.

In relation to the bet used by Bateman et al., (2007) we predict that when zero is framed as gain nothing this will be *less* attractive than a small loss, but when zero is framed as lose nothing this will be *more* attractive than the same small loss. Further, we hypothesized that these relationships will be mediated by positive affect and explained by a combination of reference point and the affect heuristic. Specifically, we contend that lose nothing, gain nothing, and a small loss carries a certain affective valence and acts as a reference point affecting the valence and salience of other parts of the bet (dollar amounts and probabilities). Reciprocally, the other parts of the bet also act as reference points affecting how participants feel about the downside of the bet. More specifically, when zero is framed as gain nothing this induces negative affect and draws attention to the potential downside of the bet, which is

not winning $9. Due to the increased focus on not winning, this makes the other parts of the bet seem more *negative*. Since gain nothing focuses attention on losing the bet, and thus not gaining $9, this actually makes the bet seem worse than losing $.05. When zero is framed as lose nothing, this induces positive affect and draws attention to the potential upside of the bet, which is being no worse off than before playing the bet and potentially winning $9. This makes the other parts of the bet seem more *positive*. In the realm of losses, lose $.05 is a fairly paltry loss, and thus represents an intermediate value between gain nothing and lose nothing. Lastly, in relation to salience, a focus on the potential downside of the bet (gain nothing) or the potential upside of the bet (lose nothing) causes different parts of the bet to be differentially weighted in evaluating overall bet attractiveness.

3. Overview of Studies

This paper examines the framing of zero (gain nothing vs. lose nothing) across two different types of framing problems: risky choice and attribute framing. In Study 1A, we vary the framing of zero in a risky choice problem by replicating and extending problems 3 and 4 from Tversky and Kahneman (1986). In study 1B, we vary the framing of zero in problem 3 with a real as opposed to hypothetical payout. In study 2, we vary the framing of zero and compare it with a small loss in an attribute framing problem, by replicating and extending a study by Bateman et al., (2007). In study 3, we test two competing explanations for the observed results in study 2.

4. Study 1A Replication and Extension of Tversky and Kahneman (1986)

In study 1A, we replicate problem 3 and 4 from Tversky and Kahneman (1986) and vary the framing of zero. Since variations in initial wealth appear to be ignored, we replicate problems 3 and 4 without any variations in initial wealth. Thus, problem 3 has an expected value of +$100 and problem 4 has an expected value of -$100. We predict that by changing the framing of zero in problem 3 a greater number of participants will select the risk-seeking option (in comparison to the original) and by changing the framing of zero in problem 4 we predict that a greater number of participants will select the risk-averse option (in comparison to the original).

4.1. Design and Procedure

Two hundred and sixty-three participants (42.2% male; average age 39) were recruited online from Amazon Mechanical Turk and paid $0.15 in exchange for their participation. Across all studies only MTurk workers who were U.S. residents and had an approval rating of 99% or higher were allowed to participate. The study employs a two condition between-subjects design. Participants were randomly assigned to condition and in each condition, participants faced two sets of dichotomous choices presented in random order. In condition 1 the original stimulus from Tversky and Kahneman (1986) problems 3 and 4 was utilized. In condition 2 a modified version of the original stimulus was utilized by reversing the framing of zero. See Table 1 for stimulus wording. Participants were given the following instructions: "Imagine that you face the following pair of concurrent decisions. First examine both decisions, then indicate the options you prefer." Lastly, participants provided basic demographic information.

4.2. Results

See Table 1 for the percentage of participants selecting each option. To test whether participants were more likely to select the risk seeking option in problem 3 and the risk averse option in problem 4 binomial tests were performed. Results indicate significantly more participants selected the risk-averse option in comparison to the risk-seeking option in original problem 3 ($p < .001$) and modified problem 3 ($p < .001$). In original problem 4 significantly more participants selected the risk-seeking option in comparison to the risk-averse option ($p < .001$), however in modified problem 4 there is no significant difference between the risk-seeking and risk-averse options ($p = 1.0$). In order to determine whether there was a significant difference between original problem 3 and modified problem 3, a chi-square analysis was performed. Results indicate significantly more participants selected the risk-seeking choice in modified problem 3 in comparison to the original (χ 2 (1) = 9.022, $p = .003$, $N = 263$). An identical analysis was performed to test for a difference between original problem 4 and modified problem 4. Results indicate significantly more participants selected the risk-averse choice in modified problem 4 in comparison to original problem 4 (χ 2 (1) = 11.803, $p = .001$, $N = 263$) thus supporting our prediction.

Table 1
Stimulus Wording and Number Participants Selecting Each Option

Stimulus Wording	Percentage of Participants
Condition 1: Tversky and Kahneman (1986) (N = 128)	
Problem 3: Original	
A. A sure gain of $100	83%
B. A 50% chance to gain $200 and a 50% chance to **gain** nothing	17%
Problem 4: Original	
A. A sure loss of $100	29%
B. A 50% chance to **lose** nothing and a 50% chance to lose $200	71%
Condition 2: Modified Framing of Zero (N = 135)	
Problem 3: Modified	
A. A sure gain of $100	66%
B. A 50% chance to gain $200 and a 50% chance to **lose** nothing	44%
Problem 4: Modified	
A. A sure loss of $100	50%
B. A 50% chance to **gain** nothing and a 50% chance to lose $200	50%

4.3. Discussion

The results of study 1A replicate and extend Tversky and Kahneman (1986) and demonstrate the importance of how zero is framed in the context of a risky choice framing problem. In condition 1 we replicate Tversky and Kahneman's original findings as the majority of participants select the risk-averse option in problem 3 and the risk-seeking option in problem 4. Since problem 3 has an expected value of +$100 and problem 4 has an expected value of -$100 this demonstrates risk aversion in the realm of gains and risk-seeking in the realm of losses. However, by modifying the framing of zero in problem 3 significantly more participants selected the risk-seeking option, and in problem 4 significantly more participants selected the risk-averse option in comparison to the original. Interestingly, in problem 4 there is no evidence of loss aversion as the number of participants selecting either option is essentially identical. This demonstrates that these decision problems are heavily dependent on how zero is framed. Next, we test problem 3 with real instead of hypothetical payoffs.

5. Study 1B: Gain Frame Replication with Real Money

The purpose of study 1B is to replicate problem 3 with real instead of hypothetical payouts. Due to the methodological issues of inducing losses experimentally, problem 4 was not included in the current study. Framing effects tend to be weak for small payoffs (Kühberger, 1998) thus a lottery system was used to increase payout size, which has been suggested as an effective method for eliciting preferences for risky decisions (Noussair, Trautmann, & Van de Kuilen, 2014). Indeed, research

has shown that lottery incentives produce similar results to paying each participant (Cubitt, Starmer, & Sugden, 1998). Similar to study 1A we predict that by changing the framing of zero in problem 3, a greater number of participants will select the risk-seeking option (in comparison to the original).

5.1. Design and Procedure

Two hundred and two participants (50.7% male; average age 37.42) were recruited online from Amazon Mechanical Turk and paid $.10 in exchange for participation, plus a 10% chance to earn a bonus based on their decisions. The study employs a two condition between-subjects design. In condition 1 participants faced a choice between A: "A sure gain of $5.00" or B: "A 50% chance to gain $10.00 and a 50% chance to gain nothing." In condition 2 choice A was identical, but the framing of zero in option B was changed from "gain" to "lose." Lastly, participants provided basic demographic information. At the conclusion of the study 22 participants were paid the cash bonus based on their decisions.

5.2. Results

In condition 1 (unmodified) 15 out of 103 participants (14.6%) selected the risk seeking option and in condition 2 (modified) 34 out of 99 participants (34.3%) selected the risk seeking option. The results of a binomial test indicate significantly more participants selected the risk-averse option in comparison to the risk-seeking option in unmodified problem 3 ($p < .001$) and modified problem 3 ($p < .001$). In order to determine whether there was a significant difference between the modified and unmodified framing of zero, a chi-square analysis was performed. Results indicate significantly more participants selected the risk-seeking choice in modified problem 3 in comparison unmodified problem 3 (χ 2 (1) = 10.750, $p = .001$, $N = 202$).

5.3. Discussion

The results of the current study replicate the findings of study 1A and show that in the realm of gains, participants are risk-averse and more importantly how zero is framed affects choice with real payouts. In study 2 we look at the framing of zero in another well-known study and test the role of affect.

6. Study 2: Replication and Extension of Bateman et al., (2007)

The purpose of study 2 is replicate Bateman et al., (2007) and vary the framing of zero. In relation to the bet used by Bateman et al., (2007) we predict that lose $.05 will be perceived as *more* attractive than gain nothing but lose nothing will be perceived as *more* attractive than lose $.05. Lastly, we predict that these relations will be mediated by positive affect.

6.1. Design and Procedure

Two hundred and ninety-five participants (50.8% male; average age 37) were recruited online from MTurk and paid $.20 in exchange for their participation. The study employs a three-cell design and participants were randomly assigned to condition. In each condition participants were asked to consider the prospect of a bet with a "20% chance to gain $9" and in condition 1 an "80% chance to gain nothing," in condition 2 an "80% chance to lose nothing," and in condition 3 an "80% chance to lose $.05." See Fig. 1. After viewing the stimulus, participants were asked to rate the attractiveness of the bet using the same wording and 21-point scale used by Bateman et al., (2007). Participants were asked to: "Indicate your opinion of how attractive this bet is by selecting a number on the rating scale below: There is no right or wrong answer, we are interested only in your opinion about the attractiveness of this bet." Responses were assessed on a 21-point scale anchored by *not at all attractive bet* and *extremely attractive bet* with the midpoint labeled *moderately attractive bet*. Next, positive affect was assessed with a single measure utilizing the following stimulus wording: "Thinking about the bet, how happy do you feel?" Responses were measured on 11-point Likert scales anchored by *not at all* and *extremely* with the midpoint labeled *moderately*. Lastly, participants provided basic demographic information.

6.2. Results

6.2.1. Attractiveness

The effects of condition on bet attractiveness were assessed with a one-way analysis of variance (ANOVA). Results indicate a significant difference between conditions on bet attractiveness ($F(2, 292) = 34.35$, $p < .001$, $\eta^2 = .19$). See Fig. 2 for means and standard deviations. Results of planned simple contrasts revealed attractiveness was significantly higher in the lose $.05 condition in comparison with the gain nothing condition ($t(292) = 4.932$, $p < .001$, $\eta^2 = .11$), and significantly higher in the lose nothing condition in comparison with the lose $.05 condition ($t(292) = 3.326$, $p = .001$, $\eta^2 = .05$).

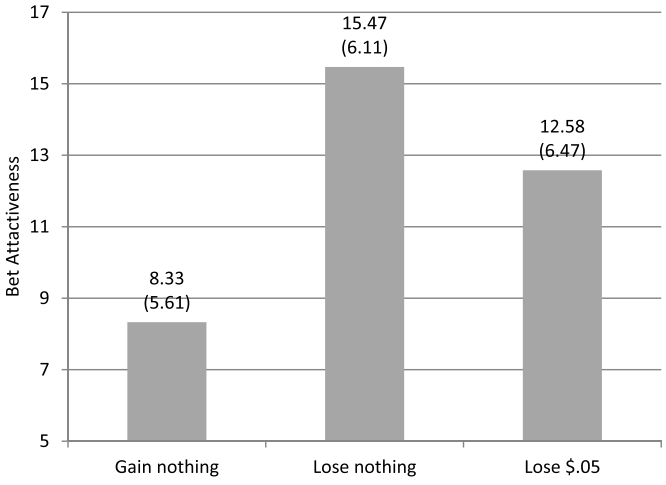

Fig. 2. Bet Attractiveness by Condition.
Note: () Denotes standard deviation; Bet attractiveness measured on a 21-point scale

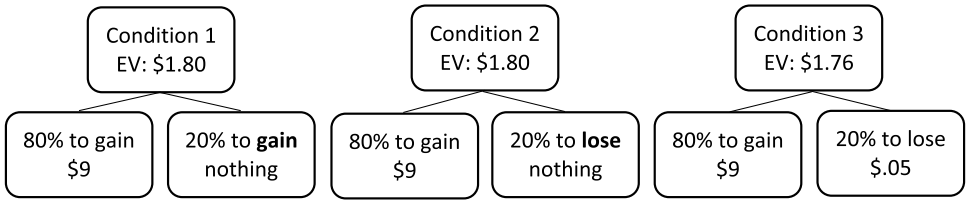

Fig. 1. Study 2 and 3 Decision Trees by Condition
EV: Expected Value

6.2.2. Positive Affect

The effects of condition on positive affect were assessed with a one-way ANOVA. Results indicate a significant difference between conditions on positive affect ($F(2, 292) = 12.41$, $p < .001$ $\eta^2 = .08$). Planned simple contrasts revealed positive affect was significantly higher in the lose $.05 condition ($M = 5.88$, $SD = 2.77$) in comparison with the gain nothing condition ($M = 4.85$, $SD = 2.49$; $t(292) = 2.802$, $p = .005$, $\eta^2 = .04$), and significantly higher in the lose nothing condition ($M = 6.69$, $SD = 2.77$) in comparison with the lose $.05 condition ($t(292) = 2.180$, $p = .030$, $\eta^2 = .02$).

Next, tests of statistical mediation were conducted with 10,000 resamples utilizing the PROCESS macro (v 2.12.1), Model 4, with 95% confidence interval used to evaluate indirect effects (Hayes, 2012). Confidence intervals that do not contain zero indicate $p < .05$. To aid in interpretation, bet attractiveness and positive affect were both standardized. First, the mediating effect of positive affect on bet attractiveness was tested for the gain nothing and the lose $.05 conditions. Condition was entered as the independent variable (coding: 1 = gain nothing; 0 = lose $.05), positive affect as the mediator, and attractiveness as the dependent variable. Condition has a significant effect on positive affect ($b = -.383$, $SE = .139$, $p = .006$) and positive affect has a significant effect on bet attractiveness ($b = .652$, $SE = .046$, $p < .001$). There is a direct effect of condition on attractiveness ($b = -.382$, $SE = .092$, $p < .001$) and a significant indirect effect ($b = .262$, SE = .094, 95% CI = .079, 447) suggesting partial mediation. Next, the mediating effect of positive affect on bet attractiveness was tested for the lose nothing and the lose $.05 conditions (coding: 1 = lose nothing; 0 = lose $.05). Condition has a significant effect on positive affect ($b = .301$, $SE = .141$, $p = .034$) and positive affect has a significant effect on bet attractiveness ($b = .673$, $SE = .049$, $p < .001$). There is a direct effect of condition on attractiveness ($b = .228$, $SE = .097$, $p = .020$) and a significant indirect effect ($b = .202$, SE = .096, 95% CI = .025, .397) suggesting partial mediation. These results show that the difference on bet attractiveness between losing $.05 and gaining nothing, and losing nothing and losing $.05, is partially due to positive affect.

6.3. Discussion

The results of this study provide evidence that how zero is framed can affect the perceived attractiveness of a hypothetical gamble in an attribute framing problem. Specifically, we demonstrate that a bet with a 20% chance to gain $9 and an 80% chance to lose $.05 is *more* attractive than the same bet paired with an 80% chance to gain nothing. Conversely, when there is an 80% chance to lose nothing this is *more* attractive than an 80% chance to lose $.05. These findings extend Bateman et al., (2007) by demonstrating that how zero is framed affects the perceived attractiveness of a simple gamble. This study also demonstrates that differences in bet attractiveness between losing nothing and losing $.05; and losing $.05 and gaining nothing is partially due to positive affect. However, it is unclear whether the different frames of zero also affect perceptions of other parts of the bet, and by what mechanism, and thus contribute to the differences in perceived bet attractiveness. Thus, the purpose of study 3 is to further explore this mechanism.

7. Study 3: Affective Mechanism

The goal of study 3 is to replicate study 2 and further test the affective mechanism driving the differences in perceived bet attractiveness. Two potential explanations for the results observed in study 2 are a combination of evaluability and the affect heuristic (Bateman et al., 2007; Hsee, 1996; Slovic et al., 2002), or a combination of reference points and the affect heuristic (Rosch, 1975).

Bateman et al., (2007) argue that win nothing does not impart a context which makes the $9 hard to evaluate. Based on their evaluability argument, there is no reason to conclude that lose nothing in comparison with gain (win) nothing should provide more context and make the $9 easier to evaluate. In reference to the current study the evaluability and affect heuristic explanation can be extended to make two predictions. First, there should be no significant difference in affective ratings of the $9 between the lose nothing and gain nothing conditions. Second, there should be a significant difference between the affective ratings of the $9 between the lose nothing and lose $.05 conditions.

An alternative explanation for the results observed in study 2 is a combination of reference points and the affect heuristic. Based on this rationale we make five specific predictions. First, when zero is framed as gain nothing, this will negatively affect the valence of other parts of the bet in comparison to lose $.05. Second, since gain nothing increases the focus on not winning the bet it will be rated *more* negatively than lose $.05. Third, when zero is framed as lose nothing, this increases the focus on being no worse off than before playing the bet and potentially winning $9, thus positively affecting the valence of other parts of the bet in comparison to lose $.05. Fourth, in the context of the bet, lose nothing will be rated *more* positively than lose $.05. Fifth, in relation to salience, we predict that the downside of the bet influences the relative emphasis or weight each part of the bet plays in evaluating overall bet attractiveness.

Utilizing a similar methodology to Bateman et al., (2007), study 3 tests the evaluability and reference point explanations by having participants provide affective ratings for each part of the bet. Specifically, affect was assessed towards each amount ($9; gain nothing/lose nothing/lose $.05) and each probability (80%; 20%). Since these probabilities sum to one, it may seem reasonable to conclude there should be a set relationship between the affective judgments of each probability. However, as established by Prelec (1998), individuals tend to overweight small probabilities and underweight high probabilities. If one of the percentages is more salient in the decision process, this could differentially affect the final judgment of bet attractiveness. Thus, both probabilities were assessed.

7.1. Design and Procedure

Three hundred participants (53.3% male; average age 37) were recruited online from MTurk and paid $.30 in exchange for their participation. The experiment employs a three-cell design identical to study 2 and participants were exposed to the same three conditions and measure of bet attractiveness used in study 2. See Fig. 1. After completing the measure of bet attractiveness, how participants felt about the probabilities (80%; 20%) and amounts ($9; gain nothing/lose nothing/lose $.05) was assessed in random order. The stimulus wording for each of the questions was as follows: "Thinking about the bet how do you feel about the…" Responses were assessed on 101-point sliding scales anchored by *extremely negative* (-50) and *extremely positive* (+50) with the midpoint (0) labeled as *neutral*. This 101-point sliding scale was adopted to capture how participants felt about the more negative parts of the bet such as losing $.05 or gaining nothing. Lastly, participants provided basic demographic information.

7.2. Results

7.2.1. Attractiveness

The effects of condition on bet attractiveness were assessed with a one-way ANOVA. Results indicate a significant difference between conditions on bet attractiveness ($F(2, 297) = 57.71$, $p < .001$, $\eta^2 = .28$). Results of planned simple contrasts revealed attractiveness was significantly higher in the lose $.05 condition ($M = 12.15$, $SD = 5.72$) in comparison with the gain nothing condition ($M = 6.69$, $SD = 4.89$; $t(297) = 6.783$, $p < .001$, $\eta^2 = .19$) and significantly higher in the lose nothing condition ($M = 15.24$, $SD = 5.72$) in comparison with the lose $.05 condition ($t(297) = 3.824$, $p < .001$, $\eta^2 = .07$).

7.2.2. Affect by Part

To test the evaluability and affect heuristic explanation a one-way ANOVA with planned simple contrasts was conducted. Contrary to the predictions of the evaluability and affect heuristic explanation, the results (see Table 2 for means and standard deviations and Table 3 for statistical tests) indicate a significant difference between the lose nothing and gain nothing conditions on the affective ratings of the $9, but *no* significant difference in the affective rating of the $9 between the lose nothing and lose $.05 conditions. Thus, these results do not support the evaluability and affect heuristic explanation.

To test the reference point and affect heuristic predictions one-way ANOVAs with planned simple contrasts were conducted. See Table 2 for means and standard deviations, and Table 3 for statistical tests. First, differences between the gain nothing and lose $.05 conditions were assessed. Supporting predictions, the results indicate significantly higher affective ratings for the 80% and $9 in the lose $.05 condition in comparison with the gain nothing condition. The affective rating of the 20% was not significantly different between conditions. Second, gain nothing was rated more negatively than lose $.05. Third, the results indicate significantly higher affective ratings for the 80% and 20% in the lose nothing condition in comparison with the lose $.05 condition. There was no significant difference in how participants felt about the $9 between the two conditions. Fourth, lose nothing was rated *more* positively than lose $.05. When comparing the gain nothing to the lose $.05 conditions three out of four affective evaluations were higher in the lose $.05 condition. Additionally, when comparing the lose nothing to the lose $.05 conditions, three out of the four affective judgments were higher in the lose nothing condition. Due to the different pattern of affective judgments between conditions this suggests that each part of the bet acts as a reference point around which the valence of other parts of the bet are judged. This pattern of results suggests why losing $.05 is judged as more attractive than gaining nothing and losing nothing is judged as more attractive than losing $.05.

To test the last prediction of the reference point and affect heuristic explanation simple linear regressions were conducted for each condition, using the affective ratings of the probabilities and amounts to predict overall bet attractiveness, and the beta coefficients were compared. For each regression, variance inflation factors (VIF) were also calculated. All VIF values ranged between 1.0 and 1.7, well below the standard cutoff values of 5 (Hair et al., 2006) and 10 (Neter, Wasserman, & Kutner, 1986) suggesting multicollinearity is not a significant factor in the interpretation of these results. In each condition the probabilities and amounts significantly predicted bet attractiveness (gain nothing condition $R^2 = .521$, $F(4, 96) = 26.077$, $p < .001$; lose $.05 condition $R^2 = .300$, $F(4, 95) = 10.160$, $p < .001$; lose nothing condition $R^2 = .340$, $F(4, 94) = 12.086$, $p < .001$). For the beta coefficients see Table 4. The beta coefficients were compared utilizing a formula from Paternoster et al., (1998) since other methods can result in the estimated standard error of the differences being negatively biased. Results indicate a number of significant differences. Comparing the gain nothing with the lose $.05 conditions, the beta coefficient for the 20% ($z = 2.118$) is significantly larger in the gain nothing condition and the beta coefficients for the $9 ($z = 5.666$) is significantly larger in the lose $.05 condition. Comparing the lose nothing with the lose $.05 conditions the beta coefficients for the $9 ($z = 3.838$) is significantly larger in the lose $.05 condition and the beta coefficients for the downside of the bet "lose nothing" ($z = 2.334$) is significantly larger in the lose nothing condition. These results show that the different downsides of the bet affected the relative weights of the other parts of the bet in evaluating overall bet attractiveness. Together these results support the reference point and affect heuristic explanation.

Table 2
Affect by Part of the Bet: Means and Standard Deviations

	Gain Nothing	Lose Nothing	Lose $.05
20%	-1.74 (24.23)	8.07 (21.56)	0.57 (20.25)
80%	-17.65 (27.04)	13.37 (28.47)	-4.81 (27.34)
$9	22.07 (20.17)	29.83 (18.15)	33.03 (17.89)
Gain nothing/lose nothing/lose $.05	-29.59 (23.19)	34.68 (21.60)	-6.95 (20.17)

Note: () Denotes standard deviation.

7.3. Discussion

Study 3 replicates the main findings of study 2 in that a bet with a chance to lose $.05 is judged as more attractive than the same bet where zero is framed as gain nothing. However, a bet where zero is framed as lose nothing is judged as more attractive than the same bet with a chance to lose $.05. Study 3 expands upon study 2 by testing two competing explanations for the differences in perceived bet attractiveness.

The evaluability and affect heuristic explanation predicts no significant differences on the affective ratings of the $9 between the gain nothing and lose nothing conditions, but a significant difference on ratings of the $9 between the lose nothing and lose $.05 conditions. These predictions are not supported by the data. Thus, the differences in perceived bet attractiveness do not conform to an evaluability and affect heuristic explanation.

The results support the reference point and affect heuristic explanation. For the gain nothing condition, three out of the four parts of the bet are judged as more negative than the lose $.05 condition, and the $9 is weighted more heavily in evaluating bet attractiveness in the lose $.05 condition. For the lose nothing condition, three out of the four parts of the bet are judged as more positive than the lose $.05 condition and lose nothing, which has the highest mean affective rating, is weighted more heavily in evaluating bet attractiveness. This pattern of results explains why losing $.05 is judged as more attractive than gaining nothing, but losing nothing is judged as more attractive than losing $.05.

8. General Discussion

Across four studies we show that how zero is framed has a substantial effect on judgment and decision-making. In study 1A we replicate and extend two risky choice decision problems from Tversky and Kahneman (1986) and in study 1B we replicate the gain frame findings of study 1A with real payouts. In study 2 we replicate and extend an attribute framing problem from Bateman et al., (2007) and explore the mediating role of affect. Study 3 builds on study 2 by further exploring the affective mechanism and testing a reference point and affect heuristic explanation.

8.1. Theoretical and Substantive Contributions

This paper makes a number of contributions. First, we show across two well-known studies (Bateman et al., 2007; Tversky & Kahneman, 1986) that changing the framing of zero either attenuates or reverses results. Further, in the case of problem 3 from Tversky & Kahneman (1986), we demonstrate these effects with real as opposed to hypothetical payouts. Thus, our main contribution is to call attention to the importance of framing zero in decision problems. Since it is unlikely that there exists a neutral framing of zero, we recommend that any future studies utilizing zero in a decision problem either omit any language which frames zero or incorporate both a positive and negative frame (see Druckman, 2001). Second, this paper adds to the literature on framing. We demonstrate that how zero is framed affects both risky choice and attribute framing problems. In the context of an attribute framing problem, the fact that losing nothing is judged as more attractive than gaining nothing is one of the few examples of a negative attribute frame producing more favorable evaluations than a positive attribute frame (Freling, Vincent, & Henard, 2014; Levin, Schneider, & Gaeth, 1998; see also Zhang and Slovic, 2019; study 2). Further, we show that in the

Table 3
Affect by Part of the Bet: Significant Tests

	ANOVA			Contrast 1*			Contrast 2**			Contrast 3***		
	F(2,297)	p	η2	*t*(297)	p	η2	*t*(297)	p	η2	*t*(297)	p	η2
20%	5.443	0.05	.04	3.161	0.002	0.05	.747	.456	0	2.41	.017	.03
80%	31.824	<.001	.17	7.943	<.001	0.24	3.296	0.001	.05	4.644	<.001	.10
$9	9.067	<.001	.06	2.923	0.004	0.04	4.139	<.001	.08	1.203	.230	.01
Gain nothing/lose nothing/lose $.05	225.36	<.001	.60	20.948	<.001	0.69	7.399	<.001	.22	13.534	<.001	.48

Note:
* Contrast between the gain nothing and the lose nothing condition.
** Contrast between the gain nothing and lose $.05 condition.
*** Contrast between the lose nothing and lose $.05 condition.

Table 4
Regression Coefficients: Each Part of the Bet on Bet Attractiveness

		Gain Nothing			Lose $.05			Lose Nothing		
Model	Variable	*b*	*t*	*p*	*b*	*t*	*p*	*b*	*t*	*p*
1	(Constant)	8.228	11.641	<.001	7.493	5.962	<.001	9.266	8.232	<.001
	20%	.059	3.570	.001	.023	.809	.421	.075	2.789	.006
	80%	.048	3.085	.003	.023	1.133	.260	.025	1.366	.175
	$9	.054	2.999	.003	.156	4.816	<.001	.037	1.204	.231
	Gain nothing/lose nothing/lose $.05	.060	3.157	.002	.057	1.946	.055	.113	4.866	<.001

Note: *b* is unstandardized regression coefficient

context of a simple gamble, losing a small amount is preferred over gaining nothing, but losing nothing is preferred over losing a small amount. We demonstrate that this effect is mediated by positive affect, thus adding to the literature of affect underlying framing effects (Kahneman & Frederick, 2007; Maheswaran & Meyers-Levy, 1990). Although prior research attributes the differences between a small loss and gaining/winning nothing to a combination of evaluability and the affect heuristic (Bateman et al., 2007) we show that this effect is more consistent with a reference point and affect heuristic explanation. Thus, we contribute to the literature on reference points and the affect heuristic (Higgins & Liberman, 2018; Slovic et al., 2002).

8.2. Loss Aversion

One potential alternative explanation for the difference between losing nothing and gaining nothing is loss aversion (Kahneman & Tversky, 1979). According to the principle of loss aversion "… a loss of $X is more aversive than a gain of $X is attractive…" (Kahneman & Tversky, 1983, p. 342). If zero is substituted for X then a loss of $0 should be more aversive than a gain of $0 is attractive. We show the opposite. However, it can be argued that "gain nothing" means a negative outcome whereas "lose nothing" means a positive outcome. Even if the difference between gaining nothing and losing nothing is considered consistent with loss aversion, loss aversion cannot account for why gaining nothing is more aversive than losing $.05. Further, loss aversion is somewhat unique as a psychological theory in that it is simply descriptive and is not defined with respect to a specific psychological process (Gal & Rucker, 2018). In other words, loss aversion does not specify why people are loss-averse but simply states that they are. Thus, irrespective of whether the difference between lose nothing and gain nothing is considered consistent with loss aversion, we contend that the differences between lose nothing, gain nothing and a small loss are due to a combination of affect and reference points.

8.3. Limitations and Future Research

This research suffers from a number of limitations including reliance on convenience samples, common response bias and with the exception of study 1B, hypothetical payoffs. To a large extent, however, we feel these limitations are mitigated by the extant research which suggests these factors have little effect on similar decision problems. For example, Bateman et al., (2007) used a number of different samples and tested a number of different modes of response, neither of which affected their overall results. Bateman et al., (2006) found that with tangible rewards a small loss was still rated as more attractive than gaining nothing. Further, as pointed out by Kühberger et al., (2002) at the time of the decision all outcomes are hypothetical. Given the similarities between our work and Bateman et al., (2007) and Bateman et al., (2006) we find it unlikely that different samples, modes of response, and real (as opposed to hypothetical payoffs) would have substantially affected our results.

Another potential limitation of this work is a reliance on an affective explanation. Although this paper has focused on an affective explanation, we are cognizant of the fact that other mechanisms likely exist. These mechanisms may provide an intriguing line of future research. For example, future research could examine the effects of memory and information processing and its effects on similar framing problems (Gonzalez, Dana, Koshino, & Just, 2005). How does a person's thought processes affect how they think through each part of the bet and how does memory effect these judgments? Relatedly, Peters et al., (2006) found a significant interaction between the comparison of gain nothing and a small loss and numeracy (skill with numbers) on perceived bet attractiveness. Specifically, the authors found that individuals higher in numeracy were more likely to perceive the bet with the small loss as more attractive. It would be interesting to run a similar study looking at numeracy and include a lose nothing condition.

Another interesting line of research could look for conditions under which gaining nothing is more attractive than losing nothing. What happens if the money in these scenarios was replaced with something disagreeable such as a form of uncomfortable exercise, physical pain, or a disagreeable task? Under these conditions would gaining nothing be more attractive than losing nothing? Further, would any of these relations be mediated by negative affect and how would these negative scenarios differ from their positive counterparts?

Lastly, and perhaps most usefully, future research could create a typology of different frames of zero and explore their effect on judgment and decision-making. For example, how does receive, acquire, or accept nothing compared with lose or gain nothing? Additionally, if the amounts used in the bet were simply replaced with mathematical operators such as +$9 and -$.05 how would this affect outcomes? This line

of inquiry would be especially useful as it could guide future researchers utilizing zero in decision problems.

In conclusion, across four studies we find an effect of how zero is framed affecting choice and the attractiveness of a small gamble. We propose and test a new explanation for differences between two different frames of zero and a small loss. Together these studies shed light on the importance of framing zero and the underlying mechanisms responsible for the differences between gaining nothing, losing nothing, and a small loss.

Conflicts of interest

The authors have no conflicts of interest to report.

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Supplementary materials

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