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Measurement-induced focusing and the magnitude of loss aversion: The difference between comparing gains to losses and losses to gains

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Research has identified loss aversion as a strong and robust phenomenon, but has also revealed some moderators affecting the magnitude of its effect on decision making. In the current article, we draw attention to the fact that even the measurement of loss aversion itself may affect its magnitude by inducing a focus on either losses or gains. In three studies, we provide empirical evidence for such a measurement-induced focus. In all studies we used coin-toss gambles—in which there is a 50/50 chance to win or to lose—to assess gain/loss ratios as a measure of loss aversion. Participants either filled out the loss side or the gain side of this gain/loss ratio. The studies consistently showed that—using within- and between-subject designs and anticipated and real coin-toss gambles—the strength of loss aversion depended on the measurement format (fill-in-the-loss versus fill-in-the-gain); filling in the loss side increased loss aversion. Moreover, loss aversion was more affected by the stakes of the gamble in the fill-in-the-loss format than in the fill-in-the-gain format.

Keywords: loss aversion, focus, coin-toss gamble, measurement, format.

1 Introduction

When making decisions, decision-makers have to consider the potential outcomes, and thus consider the potential losses and gains that may occur. For example, when speculating on the stock exchange, we have to consider the potential losses (should stock go down) and the potential gains (should stocks go up). When making such decisions—especially when people directly compare potential losses and gains—people often give more weight to the losses (e.g., Benartzi & Thaler, 1995; Kliger & Levit, 2009; McGraw, Larsen, Kahneman & Schkade, 2010). This larger weight given to negative outcomes is generally referred to as loss aversion, i.e., "losses loom larger than gains" (Kahneman & Tversky, 1979; Liberman, Idson, & Higgins, 2005; Tversky & Kahneman, 1991, 1992; Wilson & Gilbert, 2005). In addition to stock market decisions, loss aversion has been used to explain many effects observed in the context of decision making such as the sunk cost effect (e.g. Arkes & Blumer, 1985), the status quo bias (Knetsch, 1989; Schweitzer, 1994), and the endowment effect (e.g. Kahneman, Knetsch & Thaler, 1990; Van Dijk & Van Knippenberg, 1998).

Although the existence of loss aversion is well-accepted, there is still work to be done developing better accounts of its causes, boundaries and consequences. For example,

researchers generally assume that potential gains need to be approximately twice as large to offset the potential losses (Tversky & Kahneman, 1991). They introduced a loss aversion coefficient—the ratio G/L (Gains/Losses) that makes an even chance to gain G or lose L just acceptable (Tversky & Kahneman, 1991, page 1053). They observed a gain/loss ratio of 2 (2/1) in their experiments, showing that gains on average need to be twice as large as the losses to make an even chance to gain G or lose L acceptable. In the current paper, however, we will argue and show that this loss aversion ratio is not constant, but in fact influenced by how it is measured. We show that the ratio is approximately 2 when people focus on gains compared to a loss, but that the ratio increases when people focus on losses compared to a gain. We thus show that the measurement of loss aversion itself can induce a focus on either losses or gains, and that this measurement-induced focus influences the strength of loss aversion.

1.1 Explaining and measuring loss aversion

Loss aversion has been linked to the negativity bias (see for overviews e.g. Rozin & Royzman, 2001; Baumeister, Bratlavsky, Finkenauer, & Vohs, 2001). This link first of all shows that the overweighing of the negative is not restricted to the domain of decision-making. In more general terms, the negativity bias describes that people pay more attention to negative information than to positive information. For the current purposes, it is also interesting to see that the research on the negativity bias shows that it is possible to redirect a person's attention from negative information to positive information (Beck & Clark, 1997; Compton, 2000; Derryberry, 1993; Derryberry & Reed, 2002; Teasdale, Segal & Williams, 1995; Toates, 1983). Moreover, Schoemaker (1982) noted quite early that people's choices are sensitive to how the problem or decision is presented. Translated to the domain of loss aversion, these insights indicate that the magnitude of loss aversion may depend on whether people are focused on the negative or the positive.

In the current article, we draw attention to an important consequence of this reasoning, namely that the measurement of loss aversion itself may already induce a focus on the negative or the positive. In the studies that follow we show this phenomenon of what we call "measurement-induced focusing" for one of the most common ways to measure loss aversion: The assessment of gain-loss ratios in the 50/50 coin-toss gamble paradigm (Tversky & Kahneman, 1991, 1992).

In the coin-toss paradigm, participants have to consider a situation in which they can potentially win or lose an amount of money, depending on whether heads or tails turns up after a coin toss. One side of the gamble is given—for example, participants would read: "if heads turns up you win 2 euro". The other side then needs to be filled out by the participants so as to make them indifferent toward taking or rejecting the gamble. They read: " if tails turns up, you lose ____". Thus, participants directly compare potential gains to potential losses in this paradigm, which creates a situation in which people generally experience loss aversion (McGraw et al., 2010). Loss aversion in this paradigm can be measured by calculating the gain-loss ratio (G/L); a ratio that shows the relative balance between the potential gains and the potential losses. Ratios higher than 1 are indicative of loss aversion; often a gain-loss ratio of approximately 2 is found (Tversky & Kahneman, 1991, 1992), indicating that a gain needs to be about twice as large to balance a loss.

There are two possible versions of the coin-toss paradigm: (a) Participants are presented with a potential gain and asked to fill how much they are prepared to lose to take the gamble (the "*fill-in-the-loss*" version), or (b) Participants are presented with a

potential loss and asked to fill how much they should win to take the gamble (the "*fill-in-the-gain*" version). We argue that filling in losses or gains influences people's focus on the negative or positive side of the gamble, and subsequently influences loss aversion. We are not aware of any previous literature that compared these two measurement versions of loss aversion, and until now it is thus unknown how these two measurement versions of the coin-toss paradigm would affect the measured magnitude of loss aversion.

We expect these different versions of the coin-toss paradigm to yield different gain/loss ratios. We expect that loss aversion will be stronger in the "fill-in-the-loss" version than in the "fill-in-the gain" version, so the gain/loss ratios will be greater. Our reasoning is that the fill-in-the-loss paradigm—more than the fill-in-the gain paradigm—induces a focus on losses, as it requires people to consider multiple negative outcomes: Do I want to lose $70? $60? $50 or less? This focus requires consideration and elaboration of the negative outcomes, and thereby self-generated negative information about potential losses may steer people's attention away from potential gains so that they focus on the potential losses instead. This focus on the potential losses will increase their loss aversion, as reflected by higher gain/loss ratios. Conversely, the fill-in-the-gain format may redirect people's attention from negative information about potential losses to positive information about potential gains (Beck & Clark, 1997; Compton, 2000; Derryberry, 1993; Derryberry & Reed, 2002; Teasdale, Segal & Williams, 1995; Toates, 1983). This required consideration and elaboration of the positive outcomes, and thereby self-generated positive information about potential gains may steer people's attention to potential gains and thus reduce the gain/loss ratio.

In sum, the gain/loss ratios will be larger when people consider negative outcomes in the "fill-in-the-loss" versions than when they consider positive outcomes in the "fill-in-the-gain" versions. We call this the Format Hypothesis.

2 Study 1

In Study 1, we presented our participants the two formats and counterbalanced the order: Half of the participants were first presented a fill-in-the-loss format and then a fill-in-the-gain format, and the reverse for the other half. In the fill-in-the-loss format first condition, participants had to indicate how large the loss should be to balance a given gain of €48.16. In the fill-in-the-gain format first condition, participants had to indicate how large the gain should be to balance a given loss of €20.16. After having filled out the first gamble, the reported numbers were used as input for the second gamble.[1]

We also measured the amount of time participants needed to make a decision concerning the amount of money they filled out in the gambles under the two formats. Although we realize that we should be careful not to overinterpret data on response times, we reasoned that the assumed attention to negative over positive information might manifest itself in longer response times in the fill-in-the-loss format than in the fill-in-the-gain format (Fazio, 1990).

2.1 Method

2.1.1 Design and Participants

There were 41 participants, and 7 of them were excluded from the analyses because

their data differed more than three standard deviations from the average on the main dependent variables (gain/loss ratio and/or the time they needed to make a decision). The 34 remaining participants were 19 women and 15 men, and their mean age was 20.6 years. Participants individually filled out a short questionnaire on the computer. The design was a 2 (format: fill-in-the-loss vs. fill-in-the-gain) by 2 (order: loss format first vs. gain format first) design, with format as within-participants factor and order as between-participants factor. Participants engaged in a filler task that was unrelated to the experiment between filling out the first and the second coin-toss gamble.

2.1.2 Procedure and dependent variables

In the loss format first condition, participants were first presented with a coin-toss gamble in which they read: "If heads turns up, you gain € 48.16, and if tails turns up you lose € .....(L_{t1})." They were asked to fill in the amount L that made the even chance to gain 48.16 euros (G) or lose the amount L just acceptable—the amount L needed to balance the gain. Subsequently, they were presented with the second gamble that had a fill-in-the-gain format. We programmed the computer in such a way that the given loss always was the loss they filled out in the first gamble (L_{t1}). We calculated the individual G/L ratios in both formats. The G/L ratio was $48.16/L_{t1}$ in the fill-in-the-loss format, the G/L ratio was G_{t2}/L_{t1} in the fill-in-the-gain format.

In the gain format first condition, participants first had to fill in G; the amount of money that they would gain. They read: "If heads turns up, you lose € 20.16, and if tails turns up you win € ....." After they filled out the amount G, they were presented with the second gamble that had the fill-in-the-loss format. We programmed the computer in such a way that the given gain always was the gain they filled out in the first gamble (G_{t1}). The G/L ratio was $G_{t1}/20.16$ in the fill-in-the-gain format, the G/L ratio was G_{t1}/L_{t2} in the fill-in-the-loss format. Please note that any ratio above 1 means that the gains needs to be larger than the losses to balance the gamble, which is regarded as a sign of loss aversion.

Besides the gain-loss ratios, we also measured response times—the time (in seconds) participants needed to fill in the gambles.

2.2 Results

2.2.1 G/L ratios

The G/L ratios were analyzed by a repeated-measures ANOVA with format (fill-in-the-loss format vs. fill-in-the-gain format) as within-subjects factor and order (loss format first vs. gain format first) as between-subjects factor. There was a main effect of format, $F(1,32) = 4.28$, $p < .05$, $\eta^2 = .12$, showing that the G/L ratios were higher in the fill-in-the-loss format ($M = 3.15$, $SD = 2.99$, $Med = 2.00$) than in the fill-in-the-gain format ($M = 2.17$, $SD = 1.27$, $Med = 1.98$). This main effect shows that participants needed more gains relative to a loss and showed more loss aversion when they were focused on the loss side of the gamble than when they were focused on the gain side of the gamble. The main effect of order was not significant, $F(1,32) = .21$, *ns*, and the interaction of Format x Order was not significant either, $F(1,32) = .84$, *ns*, showing that G/L ratios were not influenced by the order in which participants filled out the loss and the gain format.[2]

Table 1: Response times in seconds for coin-toss gambles 1 and 2 in Study 1 (*N* = 34). Participants filled out one coin-toss gamble with a fill-in-the-loss format and one coin-toss gamble with a fill-in-the-gain format. The order in which participants filled out each format was varied.

Response time (in seconds)	Gamble 1	Gamble 2
Loss focus first	30.62 (20.49)	12.98 (6.98)
Gain focus first	23.57 (10.99)	19.41 (7.37)

2.2.2 Response time

The time needed to fill in the fill-in-the-loss format and the fill-in-the-gain format was analyzed by a repeated-measures ANOVA with the format as within-subjects factor, and order (loss format first versus gain format first) as between-subjects factor. There was a main effect of format, $F(1,32) = 6.44$, $p < .02$, $\eta^2 = .17$, qualified by an interaction of Format x Order, $F(1,32) = 16.86$, $p < .001$, $\eta^2 = .35$. Participants needed more time to fill in the fill-in-the-loss format ($M = 24.68$, $SD = 15.84$) than the fill-in-the-gain format ($M = 18.59$, $SD = 10.64$). In other words, participants needed more time when they were focused on the loss side of the gamble rather than on the gain side of the gamble. This effect of format was more pronounced when participants had the fill-in-the-loss format first, $F(1,15) = 15.14$, $p < .001$, than when participants had the fill-in-the-gain format first, $F(1,17) = 1.96$, *ns* (Table 1). This effect shows that people who focused on the loss side in the first gamble and focused on the gain side in the second gamble showed a larger time difference between the two gambles than people who focused on the gain side first and on the loss side in the second gamble.

2.3 Discussion

We found higher G/L ratios in the fill-in-the-loss format than in the fill-in-the-gain format. Moreover, Study 1 showed that this difference in G/L ratios was not contingent on the specific order of the formats. The results of the response times also support our Format Hypothesis, in which we argued that participants fill in gambles with a fill-in-the-gain format more quickly and heuristically than gambles with a fill-in-the-loss format, in which they may want to think longer about the potential negative consequences.

A post-hoc explanation for the interaction effect for the response times might be that it results from a combination of the main effect of format—participants fill in the fill-in-the-gain format quicker than a fill-in-the-loss format—and a learning effect—participants are more familiar with the task the second time, and can therefore fill in the second gamble faster than the first. In the case of the fill-in-the-loss format first condition, the format and learning effect work both in the same direction—the second gamble has a fill-in-the-gain format—resulting in very quick response times for the second gamble. In the case of the fill-in-the-gain format first condition, the format and learning effect work against each other in the second gamble—the response times in the second gamble should be lower due to the learning effect, but the loss format slows the process down.

3 Study 2—Real coin-toss gambles

Study 1 concerned gambles in which people had to indicate which amount of money they were willing to gain or lose if they would out these gambles. These coin-toss gambles were hypothetical gambles in which people anticipate future outcomes—as is often the case in prior research concerning risky decision making (Kahneman & Tversky, 1979). We deemed it worthwhile to investigate whether similar behavioral effects are found when people actually engage in the gamble. Therefore, we investigated the effect of format in coin-toss gambles that were actually carried out in Study 2. We again asked people to indicate which amount of money they were willing to gain or lose, and again, we manipulated whether they had to fill in the gain side of the coin toss or the loss side of the coin toss.

3.1 Method

3.1.1 Design and participants

The study compared a gain and a loss format of a 50-euro coin-toss gamble between participants. There were 26 participants (mean age = 25.76 years, 11 males, 12 females, 3 participants had missing data on gender).

3.1.2 Procedure and dependent variables

We made use of two prior existing work groups of a course that was unrelated to the topic of this experiment. In one workgroup ($N = 14$) we carried out the fill-in-the-loss condition, and in the other workgroup ($N = 12$) we carried out the fill-in-the-gain condition. The workgroups took place on two consecutive days, and students in the first workgroup (the fill-in-the-loss condition) were asked not to mention the experiment to students in the other workgroup (the fill-in-the-gain condition). Before we started the experiment, participants first filled in a consent form in which they read that they were going to engage in a coin-toss gamble. At the start of the experiment, the experimenter or the research assistant showed the participants a note of 50 euro. We told them that we were doing an experiment in which one of them would actually receive the 50 euro to use it in a coin-toss gamble.

All students received a sheet of paper with the instructions of the coin-toss gamble. They read that the experimenter would flip a coin, and that there was a 50% chance of winning and 50% chance of losing. We then randomly picked the name of one student —from a bag containing identical sheets of paper with each student's name on a separate sheet—but did not reveal who it was yet. Participants then filled out what amount they were willing to lose—in the fill-in-the-loss format—or what amount they needed to win—in the fill-in-the-gain format—to engage in the gamble.

The experimenter then collected all the sheets of paper with the gain/loss ratios, and revealed the name of the participant whose coin-toss gamble would be carried out. This participant was called in front of the classroom and was given the 50 euro note. The experimenter read aloud the amounts of money to be won or lost if heads or tails would turn up. In addition, to check whether the participant understood the odds, the experimenter wrote the odds on the whiteboard. Then the experimenter flipped a coin, and the chosen participant either received or paid money, depending on the coin-toss and the amounts that were filled in on the sheet of paper. Finally, all participants received 1 euro for their participation, and were thanked and debriefed.[3]

Participants took part in either the fill-in-the-loss condition, or the fill-in-the-gain condition. We recorded the amounts participants filled in before engaging in the coin-

toss gambles. In the fill-in-the-loss condition, participants were told that they would engage in a coin-toss gamble in which the potential gains were 50 euros, and that they had to decide how much they would be willing to risk losing. In the fill-in-the-loss condition, they read "If heads turns up, you gain 50 euro, and if tails turns up you lose € ..... ." They were asked to fill in the amount L that made the even chance to gain 50 euro (G) or lose the amount L just acceptable.

In the fill-in-the-gain condition, participants were told that they would engage in a coin-toss gamble in which the potential losses were 50 euro, and that they had to decide how much they needed to win in order to engage in the coin-toss gamble. Participants in the fill-in-the-gain condition read: "If heads turns up, you lose 50 euro, and if tails turns up you gain € ....." They were asked to fill in the amount G that made the even chance to lose 50 euro (L) or gain the amount G just acceptable.

We also recorded gender and age.

3.2 Results

Two participants in the fill-in-the-loss condition indicated that they were willing to lose maximally 10 eurocents, which would result in a gain/loss ratio of 5000. These two participants were excluded from the analyses. The gain/loss ratios were analyzed by ANOVA with format (fill-in-the-loss vs. fill-in-the-gain) as between-subjects factor. There was a main effect of format, $F(1,22) = 22.23$, $p < .001$, $\eta^2 = .50$. As in Study 1, participants in the fill-in-the-loss format had higher gain-loss ratios ($M = 29.44$, $SD = 20.02$, $Med = 29.17$) than participants in the fill-in-the-gain format ($M = 2.13$, $SD = 1.48$, $Med = 1.80$).[4] This result means that people who focused on the loss side of the gamble were more loss averse and needed larger gains to balance a loss than people who were focused on the gain side of the gamble.

3.2.1 Discussion

The real coin-toss gambles of Study 2 show a similar effect as the anticipated coin-toss gambles. As in the anticipated coin-tosses, there seems to be a large difference between a fill-in-the-gain format and a fill-in-the-loss format. Gain-loss ratios are much higher when people fill in the loss side of the ratio, rather than the gain side of the ratio—indicating that they are more loss averse when they fill in the loss side than when they fill in the gain side of the coin-toss. The results of the real coin-toss gambles corroborate the findings of the anticipated coin-toss gambles, validating the effects of Study 1.

4 Study 3

Study 1 and 2 showed that loss aversion—as measured by the G/L ratio in an anticipated and a real coin-toss paradigm—is predictably influenced by the format that is used to measure loss aversion. The differences between the fill-in-the-loss format and the fill-in-the-gain format support the idea of a measurement-induced focus on gains or losses. Moreover, consistent with our idea that people may elaborate more when they consider losses—we observed that people took more time to fill in the gamble when they filled in the loss side of the gamble.

In Study 3 we considered an alternative way to test our reasoning about why a fill-in-the-loss format increases loss aversion compared to a fill-in-the-gain format. If people

are more preoccupied with losses, this preoccupation would also imply that they may be more affected by the size of the stakes when they consider losses than when they consider gains. For this purpose we turned to recent research that employed the coin-toss paradigm to show that the gain-loss ratio can be moderated by the size of the stake. Harinck et al. (2007) recently showed that the amount of money that was at stake in a coin-toss gamble moderated loss aversion. Their results showed increasing G/L ratios for increasing stakes in the gambles; for stakes of 1 euro, the G/L ratio was approximately 1, but for 50 euros the G/L ratio was approximately 2. In other words, Harinck et al. showed that loss aversion is stronger for high stakes than for low stakes. Harinck et al (2007) explained the increasing loss aversion for larger amounts of money on the basis of two considerations: (1) in general, people are more motivated to discount losses than to discount gains, but (2) discounting losses is more difficult for high outcomes than for low outcomes.

We expect that loss aversion, as measured by the G/L ratio, will be more strongly influenced by the amount of money at stake under the fill-in-the-loss format than under the fill-in-the-gain format (*Format x Amount Hypothesis*). In line with the earlier work by Harinck et al. (2007), our reasoning is that the fill-in-the-loss paradigm—more than the fill-in-the gain paradigm—induces a focus on losses as it requires people to consider multiple negative outcomes (do I want to lose $70? $60? $50 or less?). People want to discount those potential losses, and will be better at discounting small amounts of money rather than large amounts of money. As a result, they will need relatively more potential gains to balance a potential loss when stakes increase. Thus, increasing the stakes in the fill-in-the-loss format will result in increasing gain-loss ratios.

On the other hand, the fill-in-the-gain paradigm—more than the fill-in-the-loss paradigm—induces a focus on gains as it requires people to consider multiple positive outcomes (do I want to gain $50 $60? $70? or more?). People are happy to accept several potential gains and will think about it less than when considering several potential losses (see Study 1). As a result, they may make quicker and more heuristic decisions when considering potential gains, and therefore we expect them to be less sensitive to the amounts at stake than when considering potential losses.

4.1 Method

4.1.1 Design and participants

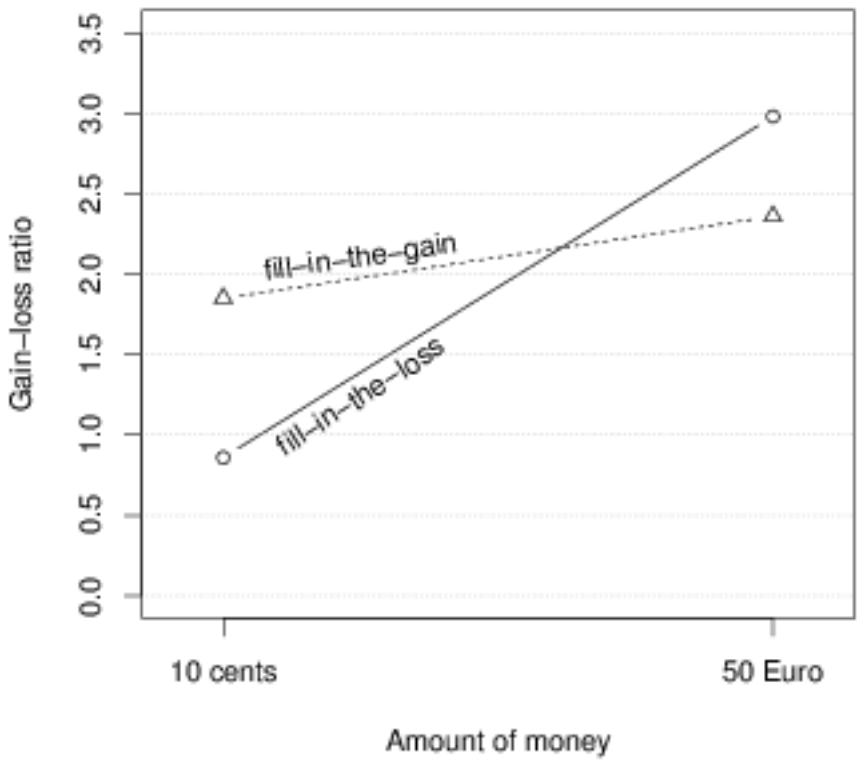
The experiment had a 2 (Amount of money: 10 cent vs. 50 euros) by 2 (Format: fill-in-the-loss vs. fill-in-the-gain) by 2 (Order: 10 cent first, vs. 50 euros first) within-participants design with the amounts of money as within-participant factor and focus and order as between-subjects factors. Fifty-six students (25 males, 31 females) from Leiden University participated; their mean age was 23.3 years. Participants received a small gift (candy bar) for participation.

4.1.2 Procedure and dependent variables

Participants were randomly assigned to the fill-in-the-loss format of the coin-toss paradigm or to the fill-in-the-gain format. They participated in two (anticipated) gambles in which a coin would be tossed; in one coin toss a small amount of money was at stake—10 cents—and in the other coin toss a large amount of money was at stake—50 euros. The formats were presented as in Study 1 and 2. We presented the two amounts of money in ascending order for half of the participants and descending order for the other half of the participants.

4.2 Results

Figure 1: G/L ratios as a function of the amount of money and format in Study 3.



4.2.1 G/L ratio

The G/L ratios were analyzed with a repeated-measures ANOVA with the amounts of money (€ 0.10 vs. € 50.00) as within-subjects factor and order (ascending vs. descending) and format (fill-in-the-loss vs. fill-in-the-gain) as between-subjects factors. The results showed a main effect of amount of money, $F(1,52) = 11.65$, $p < .001$, $\eta^2 = .18$ and interaction of Amount x Format, $F(1, 52) = 4.36$, $p < .05$, $\eta^2 = .08$, but no main effect of format, $F(1,52) = .27$, *ns* (see Figure 1). The main effect of order and the interactions including order were not significant, all Fs < 1, showing that the gain-loss ratios were not affected by filling in a small gamble or large gamble first.[5]

The main effect of amount showed that the G/L ratio was smaller for 10 cents ($M = 1.36$, $SD = 1.02$, $Med = 1.00$) than for 50 euros ($M = 2.67$, $SD = 2.77$, $Med = 1.67$), the interaction showed that this effect was more pronounced in the fill-in-the-loss format, $t(27) = -3.53$, $p < .001$, than in the fill-in-the-gain format, $t(27) = -1.14$, *ns*. Thus, when people are focused on the loss side of the gamble, they are more sensitive to the amount of money that is at stake, and their loss aversion increases with larger amount of money at stake. On the other hand, when people are focused on the gain side of the gamble, their loss aversion is less sensitive to the amount of money that is at stake. These findings are in support of the Format x Amount Hypothesis; people's G/L ratios seem to be more sensitive to variations in the amount of money that is at stake when the gambles are presented in a fill-in-the-loss format than when they are presented in a fill-in-the-gain format.

Moreover, we replicated the effect of Harinck et al. (2007), who showed that participants had G/L ratios lower than 1 when small amounts of money were at stake in coin-toss gambles. Harinck et al. (2007) used only the fill-in-the-loss format. In the current study, the G/L ratio of 10 cents in the fill-in-the-loss format ($M = .86$, $SD = .36$, $Med = 1.00$) was lower than 1, $t(27) = -2.01$, $p = .054$. The G/L ratio of 10 cents in the fill-in-the-gain format ($M = 1.86$, $SD = 1.21$, $Med = 2$) was higher than 1, $t(27) = 3.72$,

$p < .01$. This result means that participants showed reversed loss aversion when they were focused on the loss side of gambles in which they could gain 10 cents. It seems that in such small gambles a small loss is balanced by an even smaller gain.

4.3 Discussion

In Study 3, we again showed that the strength of loss aversion increased when the larger amounts of money were at stake, but only when participants had to fill in the loss side of the gamble and not when they filled in the gain side of the gamble. These findings are in support of the Format x Amount Hypothesis. The results of Study 3 also showed that the order in which the amounts of money are presented—increasing or decreasing—does not affect our main finding. These results replicate and qualify the prior findings of reversed loss aversion by Harinck et al. (2007). The current results show that reversed loss aversion was found when people had to consider the loss side of a coin-toss gamble, but not when they had to consider the gain side of a coin-toss gamble.

5 General discussion

Loss aversion plays a key role in decision making. Although loss aversion is a robust phenomenon with profound effects on the decisions we make, the strength of loss aversion can be moderated by contextual features (e.g. the amount of money that is at stake in the decision (Harinck et al. 2007), or the individual intentions of decision makers (Novemsky & Kahneman, 2005). These moderating factors show that context matters when it comes to loss aversion, we now revealed another moderator—the effect of the measurement format, which focuses people's attention to losses or gains.

In three studies, we used coin-toss gambles, in which there are equal chances (50/50) to gain or lose money, to assess gain/loss ratios as a measure of loss aversion. We varied the extent to which participants had to consider potential losses or potential gains in the gambles by varying the measurement format. In the fill-in the-loss format, the potential gains in the gamble were given and people had to fill in the loss side of the coin-toss gamble. In the fill-in-the-gain format, the potential losses in the gamble were given and people had to fill in the gain side of the gamble.

Our studies consistently showed, using within- and between-subject designs and anticipated and real coin-toss gambles, that loss aversion in symmetrical gambles was larger when people filled in the fill-in-the-loss format compared to the fill-in-the-gain format—supporting the *Format Hypothesis*. The results of the response times in Study 1 also support our Format Hypothesis; participants fill in gambles with a fill-in-the-gain format more quickly than gambles with a fill-in-the-loss format. This finding fits with the idea that people decide more heuristically when they think about potential gains, rather than potential losses.

Our Format Hypothesis holds for anticipated gambles with anticipated outcomes and for real gambles, as shown in Study 2. We investigated whether our coin-toss gamble would yield different results with anticipated outcomes—as in Study 1 and 3—or with real outcomes—as in Study 2. We found a similar effect of format—larger G/L ratios in the fill-in-the-loss format than in the fill-in-the-gain format—in a coin-toss gamble in which participants actually could win or lose 50 euros. The G/L ratio of a coin-toss gamble with a fill-in-the-gain format was close to 2, which was found in Study 1 and 3 as well, and this G/L ratio is in line with prior research by Kahneman and Tversky (Tversky & Kahneman, 1991, 1992). The G/L ratio in the fill-in-the-loss format in the

real gambles was higher than 2, replicating the main effect of format in anticipated gambles of Study 1 and 3. If anything, the effects in the fill-in-the-loss format seem stronger in the real coin-toss gambles compared to the anticipated coin-toss gambles, and the studies using anticipated gambles may thus be a conservative test of the effects under investigation.

The Format Hypothesis was further supported in Study 3, by showing that participants were more influenced by the amount of money that was at stake in the fill-in-the-loss format than in the fill-in-the gain format. These results are also in line with earlier work by Harinck et al. (2007). They showed increasing gain-loss ratios in coin-toss gambles when larger amounts of money were at stake. Study 3 replicates their findings for the fill-in-the-loss format, but shows that gain-loss ratios remain stable when a fill-in-the-gain format is used.

5.1 Theoretical implications

The current studies add to our knowledge of the causes, boundaries and consequences of loss aversion. First, we showed that in a seemingly symmetrical situation—in which people fill in the gain or the loss side of a 50/50 bet—their loss aversion is stronger when they needed to fill in the loss side compared to the gain side. Earlier research by Tversky and Kahneman (1992) showed that people generally prefer a gain/loss ratio of approximately 2 to 2.5. In this earlier work (Tversky & Kahneman, 1992, p. 306), however, the measurement induced a gain focus; participants had to fill in how much they wanted to gain given a 50% chance to a given loss. Our research can qualify these earlier findings; we replicated this ratio in the anticipated and in the real coin-toss gambles when a fill-in-the-gain format was used. We did not, however, find it when a fill-in-the-loss format was used. In the case of a fill-in-the-loss format, the ratio became larger than 2, and increased even more when larger amounts of money were at stake, and increased even more when real amounts of money were at stake.

The finding that loss aversion increases when individuals think about the potential losses in the coin-toss gamble rather than about the potential gains, in line with the negativity bias (Baumeister et al., 2001; Ito, Larsen, Smith & Cacioppo, 1998; Rozin & Royzman, 2001). The negativity bias posits that individuals are more affected by negative information (such as potential losses) than by positive information (such as potential gains). The finding that loss aversion increases when larger amounts are at stake when individuals are focused on losses, but remains the same when individuals are focused on gains is also in line with the negativity bias.

Our reasoning is also in line with another theory about risky decision making; query theory (Johnson, Häubl, & Keinan, 2007; Weber, Johnson, Milch, Chang, Brodscholl & Goldstein, 2006). Query theory states that people engage in a series of queries (or questions) when evaluating a risky decision and choosing one of the options. This theory assumes that the final evaluation or preference in the risky decision is the result of how people process the information about the risky decision (Johnson et al., 2007). In our study, the queries in the fill-in-the-loss version could be 1) How do I evaluate the amount to be won? 2) Which loss would balance this gain? The queries in the fill-in-the-gain could be: 1) How do I evaluate the amount to be lost? 2) Which gain would balance this loss? It seems that people think more about—and are more affected by—potential losses when they are focused on the loss side of the gamble rather than on the gain side of the gamble.

Our findings may also be compared with a promotion or prevention focus, as described in Regulatory Focus theory (Higgins, 1998; Scholer, Zou, Fujita, Stroessner &

Higgins, 2010). Regulatory Focus Theory (Higgins, 1998) states that people can be promotion-focused—focused on acquiring gains and the attainment of goals—or prevention-focused—focused on avoiding losses and the prevention of failure. In the last decade, scholars have studied the link between a person's regulatory focus and risk-taking behavior in economic or non-economic contexts (Bryant & Dunford, 2008; Idson, Liberman & Higgins, 2000; Halamish, Liberman, Higgins & Idson, 2007; Hamstra, Bolderdijk & Veldstra, 2011). The general finding is that promotion-focused people take more risks than prevention-focused people, although there are circumstances that cause prevention-focused people to take very large risks (Scholer et al., 2010). In line with the research on regulatory focus, our findings show that people who are focused on the potential gains rather than the potential losses are willing to engage in riskier gambles when comparing gains and losses.

At this point, it may be interesting to consider alternative explanations for our findings.[6] One might wonder, for example, whether our findings could be the result of anchoring-and-adjustment (Slovic & Lichtenstein, 1971; Tversky & Kahneman, 1974). If people take the given amount as anchor—for example 10 euro—and adjust it upward in the fill-in-the-gain format—for example add 5 euro to the given amount of money—and adjust it downward with the same amount in the fill-in-the-loss format—subtract 5 euro from the given amount of money. This procedure would result in a gain/loss ratio of 1.5 (15/10) in the fill-in-the-gain format and 2 (10/5) in the fill-in-the-loss format.

Although this process of anchoring-and-adjustment could explain the main effect of format, it cannot by itself explain the interaction effect of Format x Amount. The gain-loss ratios remain stable for the gain format when larger amounts of money are at stake, but for the loss format, the gain-loss ratios increase when larger amounts of money are at stake. Thus, the difference between the ratios in the gain and loss format increases (non-linearly), due to the increase in just the loss format. If anchoring-and-adjustment would take place, we would expect a more stable gain-loss ratio for the loss format, and a more stable or smaller difference between the gain and the loss format than we currently find.[7].

Another explanation for the format effect could be one of thought-induced polarization (Tesser, 1976). This process would be that the more people think about losses—as in the fill-in-the-loss format—the worse these losses become, resulting in stronger loss aversion. On the other hand, the more people think about gains—as in the fill-in-the-gain format—the better these gains become, resulting in less loss aversion. The effects of the amount of money, however, show that this thought-induced polarization for gains seems less likely; the gain-loss ratio (as indicator of loss aversion) remains rather stable at approximately 2 for increasing amounts of money. We would have expected a decreasing loss aversion for higher amounts of money in case of thought-induced polarization in the fill-in-the-gain format, but instead, loss aversion was not affected by the amount of money in this format.

5.2 Conclusion

The strength of loss aversion can be influenced by the measurement format; it matters whether you compare losses to gains or gains to losses. Loss aversion—as measured by G/L ratios in real or anticipated coin-toss gambles—is stronger when people have to consider the loss side of the gamble than when they have to consider the gain side of the gamble. Our research also shows that loss aversion increases when larger amounts of money are at stake, but especially when people fill in the loss side of the gambles. Loss aversion did not vary with the amount of money at stake when people filled in the

potential gains in the gamble. Thus, it seems that comparing losses to a gain is different from comparing gains to a loss, and the focus of the comparison influences the amount of loss aversion that people experience. We conclude that researchers should be careful when measuring loss aversion—how loss aversion is measured determines its strength.

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These amounts of money were chosen—based upon a pilot stud—to avoid that participants would make heuristic decisions by quickly splitting the amount. We expected that an amount of 48.16 or 20.16 would need more thinking than an amount of 50 or 25 euros.

[2]

As gain-loss ratios are sensitive to extreme outliers, we performed a log transformation of the G/L ratio and repeated the ANOVA. The results showed no significant effects. The difference between the two analyses seems to have come about because the format effect was limited to those who showed relatively high G/L ratios in both conditions. Specifically, with the log transforms, the difference between the two (transformed) ratios was highly dependent on their sum: In a regression of the difference on the sum, the (unstandardized) slope of 0.35 was significant ($t = 3.44$, $p = .0017$), but the intercept of −.16 was not significant. The intercept of essentially 0 suggests that those who do not show loss aversion at all in the fill-in-the-gain condition will not show it in the fill-in-the-loss condition either. The format effect does not seem to create loss aversion out of thin air.

3

Participants knew they were allowed to withdraw from the experiment at any point in time. None of the participants withdrew.

4

We performed a log transformation of the G/L ratio and repeated the ANOVA. The results again showed an effect of format, $F(1,22) = 53.77, p < .001$, $\eta^2 = .71$.

5

As G/L ratios can be sensitive to extreme values, we also performed a log-transformation and analyzed the $\log^{10}$(G/L) with a similar repeated-measures ANOVA with the amounts of money (€ 0.10 vs. € 50.00) as within-subjects factor, and format (fill-in-the-loss vs. fill-in-the-gain) and order (.10–50 vs. 50–.10) as between-subjects factor. The analysis of the $\log^{10}$(G/L) showed a main effect of amount of money, $F(1,52) = 24.51, p < .001, \eta^2 = .32$, and a main effect of format, $F(1,52) = 5.59, p < .03$, $\eta^2 = .10$, qualified by an interaction of Format x Amount, $F(1,52) = 14.06, p < .001$, $\eta^2 = .21$. The main effect of order was not significant, $F(1,52) = .08$, *ns*., nor was the interaction with order, all Fs < 1.55, all ps > .20.

6

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7

If people would add or subtract for example 25 euro to a large amount of money, for example 50 euro—this procedure would result in a gain/loss ratio of 2 (50/25) in the fill-in-the-gain format and 1.5 (75/50) in the fill-in-the-loss format.
