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(Dis)honesty in the face of uncertain gains or losses

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ABSTRACT

We examine dishonest behavior in the face of potential uncertain gains and losses in three pre-studies ($N = 150$, $N = 225$, $N = 188$) and a main study ($N = 240$). Ample research has shown that people cheat when presented with the opportunity. We use a die-under-cup paradigm, in which participants could dishonestly report a private die roll and thereby increase the odds to obtain a desired outcome. Results showed that the framing of the uncertain situation mattered: Participants who lied to decrease the likelihood to experience a loss used major lies (i.e., reporting a '6'), while those who lied to increase the chance to achieve an equivalent gain used more modest lies.

1. Introduction

Opportunities to be dishonest are frequent and pose a dilemma. For example, when declaring expenses for reimbursement, lying helps pursuing one's self-interest (get more money back), but lying also poses a threat to one's self-concept as a decent, honest person (Mazar, Amir & Ariely, 2008). Ample research has addressed how people deal with this conflict between self-interest and self-concept. Experimental studies have shown that the extent to which people lie is determined by their use of self-serving justifications allowing them to lie while feeling honest (Mazar et al., 2008; Shalvi, Dana, Handgraaf & De Dreu, 2011; Shalvi, Gino, Ayal & Barkan, 2015). When faced with the possibility to lie, people seem to strike a balance between maximizing profits through lying and maintaining a positive self-concept, avoiding minor lies that only provide little profits and major lies that pose a higher threat to their self-concept as an honest person (Shalvi, Handgraaf et al., 2011). Lying to others thus often involves lying to oneself: People lie, yet they try and uphold their belief in being honest individuals. Interestingly, self-serving lies have mostly been investigated in studies where lying yields certain benefits. The question we tackle in the current paper is: how do people lie when doing so only increases the likelihood of a desired outcome, rather than securing it? We put forward the hypothesis that people use major lies to prevent losses, but use more modest lies to achieve gains.

2. Loss frames increase dishonesty

The aim of lying can be to achieve a gain (or a positive outcome), or to prevent a loss (or a negative outcome). The way choices are

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framed has a powerful impact on decision making (Kahneman & Tversky, 1979). It appears that the prospect of gains is less desirable than the possibility of equivalent losses is undesirable (Abdellaoui, Bleichrodt, & Paraschiv, 2007; Gächter, Johnson, & Herrmann, 2021; Tversky & Kahneman, 1992). While the psychological reasons behind why and when people are more sensitive or motivated to avoid losses than to achieve gains are still debated (Ert & Erev, 2013; Gal, 2018; Gal & Rucker, 2018; Johnson, Haeubl & Keinan, 2007; Mrkva, Johnson, Gächter & Herrmann, 2020; Schmidt & Traub, 2002; Yechiam, 2019; Yechiam & Hochman, 2013a, b), several studies support the impact of framing on dishonest behavior. For example, people were found to lie more on their taxes in order to avoid a balance due (i.e., prevent a financial loss) than in order to get a refund (i.e., achieve a financial gain; Fochmann & Wolf, 2019; Robben, Webley, Weigel, Wärneryd, Kinsey et al., 1990). Similarly, Kirchler and Maciejovsky (2001) demonstrated that self-employed and business entrepreneurs' tax compliance is highly dependent on the reference point. In particular, expecting refunds was associated with high tax compliance, whereas expecting to make additional payments led to lower compliance. Polman, Van Swol and Hoban (2020) analyzed eleven seasons of the national Football League (NFL) and found that players committed more foul play when their team was losing rather than winning.

A higher likelihood to engage in dishonest behavior in order to prevent losses rather than achieve gains has also been documented in controlled experiments with different paradigms. For instance, Kern and Chugh (2009) and Pettit, Doyl, Lount and To (2016, Experiment 3), showed in vignette scenario studies that decision-makers reported more intentions to behave unethically if the consequences of the decisions were framed in terms of losses instead of gains.

More lying in loss- rather than gain frames was also shown in several studies using matrix games in which participants were paid according to the self-reported number of tasks they solved (e.g., Cameron, Miller & Monin, 2008; Grolleau, Kocher & Sutan, 2016; Nagel, Patel, Rothstein & Watts, 2020; Pettit et al., 2016). Grolleau et al. (2016) argued that lying could be considered as more acceptable since the norm of being honest is less strict in the domain of losses (see also Cameron et al., 2008). Lying has also been investigated in coin-flip or die-roll tasks, where participants were paid according to their report of a random event. While Huynh (2020), Markiewicz and Czupryna (2020), Schindler and Pfattheicher (2017) and Schitter and Palan (2018) found more lying under a loss frame rather than a gain frame, no effect of frames was reported in a scenario study by Sakamoto, Laine and Farber (2013) and a die-roll study by Ezquerra, Kolev and Rodriguez-Lara (2018). Charness, Blanco-Jimenez, Esquerra and Rodriguez-Lara (2019) investigated lying under loss- and gain frames and various financial compensations. They did not find the expected effect of more lying in the loss frame. Instead, it appeared that participants lied less when they received an envelope with cash money from which they could take their own experimental pay. Finally, Garbarino, Slonim and Villeval (2019) showed how decision-makers' loss aversion, induced by low payoff expectations, increases their likelihood to lie.

2.1. Modified die-under-cup paradigm

A common paradigm to investigate lying is the "die-under-cup task" (Fischbacher & Föllmi-Heusi, 2013; Shalvi, Dana et al., 2011) in which participants roll a die in private and receive a payment directly equivalent to the outcome of the roll in such a way that the higher the number they report, the more money they are paid. An important aspect of these experiments is that they allow for absolute privacy in the sense that the result can only be observed by participants themselves. The lack of monitoring allows people to dishonestly report a higher result than the one observed, in order to secure a higher payoff.

Each of the six sides of the die should be rolled with the same frequency. That means, that 16.7% of the participants should report to have rolled a '1,' 16.7% should report a '2,' and so on. Comparing the frequencies with which an outcome is actually reported to the base-rate of 16.7% allows conclusions about lying behavior. If, for example, the number of participants who report having rolled a '6' differs significantly from the number of participants who can be expected to have rolled a '6' (i.e., 16.7% of the participants), it can be concluded that some of the participants (the percentage that exceeds the 16.7% who actually rolled a '6') have lied and reported a '6,' although they have rolled a lower number. In general, findings from such studies suggest that even though people overstate their reports, they do not lie to the highest degree possible. While, by doing this, individuals forgo benefits, empirical findings suggest that, by not lying to the extreme, individuals can preserve a more favorable self-concept of themselves (Mazar et al., 2008; Ariely, 2012)[1].

Here, to increase external validity, we implement a version of the die rolling task in which lying increases the likelihood of obtaining a higher outcome (Celse, Max, Steinel, Soraperra & Shalvi, 2019). Decision outcomes are often uncertain. It is rarely the case that people know with certainty that lying will lead to the desired outcome. Instead, being dishonest might increase one's chances of acquiring a particular benefit rather than securing it. For example, job candidates may lie on their CV in order to increase the chance of being invited for an interview. From previous research, we know a lot about lies that lead to certain desired outcomes, but we know little about lying in situations where lies do not secure desired outcomes, but rather increase the probability of getting them.

To introduce uncertainty to the standard die-roll paradigm, we modified it such that lying would reduce uncertainty rather than lead to higher benefits by reporting higher numbers. Specifically, participants received a bowl containing six white balls. Depending on the reported outcome of the die-roll, these white balls are replaced by yellow balls. In particular, the number that participants report leads to the substitution of the corresponding number of balls. Then, participants randomly draw a ball and earn €6 if the ball they drew is yellow, €0 otherwise. In such a setting, the outcome of the die-roll determines the probability of winning rather than the monetary value of the outcome. This means that over-reporting increases the chance of receiving money. Past work (Celse et al., 2019) found that people lie to similar extents in certain versus uncertain settings. However, what is unknown is how framing influences lying

[1] Related to the notion that partial lies are less threatening to one's self-concept, Clot, Grolleau and Ibanez (in press) demonstrated that observers judge partial lies as less severe wrongdoings than lies to the full extent.

when it increases the likelihood to not lose a desired outcome rather than increase the likelihood to gain it.

It is reasonable to assume that the introduction of a probabilistic setting to the die-roll paradigm would facilitate lying by allowing for self-justifications to be made. When people have rationales for their behavior, it makes an unethical act feel less dishonest (Shalvi, Dana et al., 2011). Thus, when the outcome of the die roll is not fully dependent on a person's report, a lower sense of responsibility should facilitate maintaining a positive self-concept by attributing the desired outcome to luck rather than lying. Cheaters who tell such a "minor lie" (Shalvi, Handgraaf et al., 2011) can maintain their self-perception by believing that they have obtained a desired outcome not because they have cheated, but because they were lucky in the ball draw. In other words, reporting a '5' leaves a "moral wiggle room" that allows attributing winning to luck. Whereas when dishonestly reporting a '6,' this external attribution is no longer possible, as the desired outcome cannot be attributed to anything other than lying. An attempt to increase the chance of getting the desired outcome while still being able to attribute the positive outcome to luck rather than one's own cheating should lead to minor lies, that is, an over-report '5's (and maybe '4's) rather than major lies, that is an over-report of '6's.

2.2. The influence of framing on telling major and more modest lies

Previous research suggests that major lies pose a higher cost to one's self-concept than more modest lies (Shalvi, Handgraaf et al., 2011). We propose that a contextual characteristic influences the choice of major and modest lies: framing of the situation as gains or losses. As outlined above, several studies showed that framing influences lying rates (albeit, in settings where outcomes are certain). There are several theoretical explanations that attempt to explain this. According to the value function of prospect theory, people weigh equal losses more negatively than equal gains positively (Kahneman & Tversky, 1979). This shift in subjective value should, accordingly, influence the tradeoff between maintaining a positive self-concept and maximizing expected earnings by lying. Assuming that losing €6 "hurts" more than gaining €6 "makes you happy," if given the opportunity, people may "sacrifice more self-concept" to avoid losing €6 than they would in order to gain €6. Yet, even without having to assume a value function as formulated in Prospect Theory, Cameron et al. (2008) showed that people felt that they deserved more money and lied more when they did a task in which failure led to losing money compared to when success led to earning money. This increased feeling of deservingness when faced with the prospects of losing money provides a justification for lying and may, therefore, increase the likelihood of telling major lies. Under a gain frame, this justification is missing, which could lead people to rely more on other strategies to maintain a positive self-concept, like telling modest lies (or, in Cameron et al.'s terms, partial lying).[2]

Based on this reasoning, people should more likely tell a major lie in order to prevent a loss than in order to achieve a gain. Accordingly, we propose that in a loss frame, the desire to remove risk is stronger than the desire to maintain a positive self-concept, so reporting a '6' is more likely in a loss frame. In a gain frame, the desire to maintain a positive self-concept cannot be as easily overruled by loss-aversion, and people should feel less deserving (Cameron et al., 2008). In order to justify one's behavior, people should over-report '5' (and maybe '4') rather than '6', as this leaves a "moral wiggle room" that allows attributing winning to luck.

Taken together, we thus predict: The framing of the decision situation will affect lying, so that in a loss frame, major lies (i.e., '6') will occur more often than they would occur in a random distribution, while in a gain frame, more modest lies (i.e., '5' and maybe '4'), but not major lies (i.e., '6') will be reported more often than they would occur in a random distribution.

We tested this prediction in a series of three pre-studies and one main experiment. Besides an initial test of the predictions in a smaller sample, the purpose of the pre-studies was to develop a credible manipulation of a loss frame (Pre-studies 1, 2 and 3) and to compare our probabilistic paradigm to the standard paradigm with certain outcomes (Pre-study 3). The main study investigates the effect of gain vs. loss context on lying in a larger sample.

3. Pre-study 1

3.1. Method

We conducted a laboratory experiment in a between-subjects design to test the predictions. The experiment resembled the die-roll task (Fischbacher & Föllmi-Heusi, 2013, Shalvi, Dana et al., 2011), to which we added a ball draw, to make payoffs probabilistic rather than certain.

Participants and design. A total of 150 first-year students of psychology and pedagogic science ($n = 47$ male and $n = 103$ female, mean age 21.39 years, $SD = 3.04$) of a Dutch university participated for course credit and the chance to win additional money. They were recruited through the university's online system, on which the study was advertised as a "study into uncertain events." Participants were randomly assigned to one of two experimental conditions (i.e., gain or loss frame).

Manipulation of gain and loss frames. Participants in the *gain-frame condition* read that the uncertain event in this study was a ball draw at the end, in which they could win an additional cash prize of €6 (approx. 7 USD). In the informed consent form and all instructions (see below) the outcomes were framed as gains. For example, they read: "You have to randomly draw one ball which determines whether you win €6. If the ball you draw is yellow, you win €6; if the ball you draw is white, you win nothing."

In the *loss-frame condition (with cash)*, participants received €6 (a €5 banknote and a €1 coin) upon entering the cubicle and were told to store the money in their wallet. They read that the uncertain event was a ball draw at the end, which determined whether they

[2] We thank an anonymous reviewer for pointing us to this argument.

would lose the €6. In the informed consent form and all instructions (see below) the outcomes were framed as losses, for example: "You have to randomly draw one ball which determines whether you lose your €6. If the ball you draw is yellow, you may keep your €6; if the ball you draw is white, you lose your €6."

Procedure. Participants were seated in individual cubicles and received instructions on paper. To increase the face validity of the advertised research goal (i.e., investigate uncertainty), they were asked to think of the upcoming ball draw, and fill in a questionnaire, which consisted of 44 statements taken from the Work Locus of Control Scale (Spector, 1988; e.g., "Making money is primarily a matter of good fortune") and the FAD-plus Free Will and Determinism scale (Paulhus & Carey, 2011; e.g., "No one can predict what will happen in this world").

After they filled in the questionnaire, participants read instructions about the upcoming ball draw. Specifically, they learned that the number of winning balls in the ball draw would depend on a die roll, and that they were to roll the die themselves. The number displayed by the die would determine the number of yellow (i.e., winning) balls that would replace the white (i.e., non-winning) balls in the bowl. We used a die-under-cup procedure as in previous research (e.g., Fischbacher & Föllmi-Heusi, 2013; Gino & Ariely, 2012; Shalvi, Dana et al., 2011; Shalvi, Handgraaf et al., 2011; Utikal & Fischbacher, 2013): Participants were given an opaque cup with a cover and a small hole located at the bottom through which participants could see a die in the cup. They were told to shake the cup to throw the die, then put it down and, without moving the cup, look through the hole to observe the outcome of the throw. Participants had to remember the outcome of the first roll, as it would determine the number of yellow balls. After the first roll, they had to roll the die under the cup two more times to verify that the die is legitimate. Then, they had to mark the outcome of the first roll on a decision sheet.

After the die roll, participants joined the experimenter to do the ball draw. The experimenter substituted a number of white balls by yellow ones, corresponding to the outcome marked on the decision sheet. Participants blindly drew one ball. If it was yellow, they received €6 (in the gain condition) or were told that they may keep the €6 (in the loss condition). Participants who drew a white ball won no money (in the gain condition) or had to return the €6 (in the loss condition). Lastly, participants signed receipts for course credit and money, were thanked, and debriefed.

Dependent measures. The dependent variable in this study is the *reported outcome*. Participants indicated the outcome of their first die roll on a decision sheet. Participants also filled out questionnaires before the main task (as described above). Yet, these questionnaires were control measures which are not analyzed for the purposed of this paper. Participants further indicated their age and gender.

3.2. Results

Table 1 and Fig. 1 display the frequencies with which participants reported each of the six equally likely outcomes of their die roll. We conducted one-sample non-parametric Chi^2 tests in both experimental conditions, to test whether the six outcomes were reported with equal probabilities. If participants report honestly, all outcomes should be reported with equal frequencies (i.e., 16.7%). If the reported outcomes would not occur with equal frequencies (e.g., if '5' or '6' are reported with a higher frequency than the 16.7% base rate), we can assume that some participants have inaccurately reported their die roll. The prediction was that higher outcomes would be over-reported, and in particular, more modest lies (over-reports '5' and maybe also '4') would occur in the gain-frame condition, and more major lies (over-reports of '6') in the loss-frame condition.

Results suggested that participants honestly reported their outcomes, as the null hypothesis, that the distribution of reported outcomes occurs with equal probabilities and can neither be rejected in the gain-frame condition [$Chi^2(df = 5, n = 75) = 7.480$, $p = .187$], nor in the loss-frame condition [$Chi^2(df = 5, n = 75) = 1.400$, $p = .924$]. Note that in the gain-frame condition, a binomial test indicated that the proportion of '5' (25.3% of all reports) was higher than the expected 16.7%, $p = .037$ (one-sided).

3.3. Discussion

We had expected that participants would report higher outcomes than the ones they actually rolled in order to improve their chances to obtain a desired outcome, that is, to increase the chance of winning or to decrease the risk of losing €6. We found that, as predicted, participants in the gain-frame condition most frequently reported having rolled a '5.' The outcome which was reported least

Table 1
Reported outcomes by frame condition in Pre-study 1.

	Gain Frame		Loss Frame (cash)	
Reported Outcome	*n*	%	*n*	%
1	10	13.3	16	21.3
2	12	16.0	12	16.0
3	11	14.7	11	14.7
4	16	21.3	12	16.0
5	19	25.3*	11	14.7
6	7	9.3	13	17.3
Total	75	100.0	75	100.0

Note. * $p < 0.05$ (one-sided) based on a binomial test.

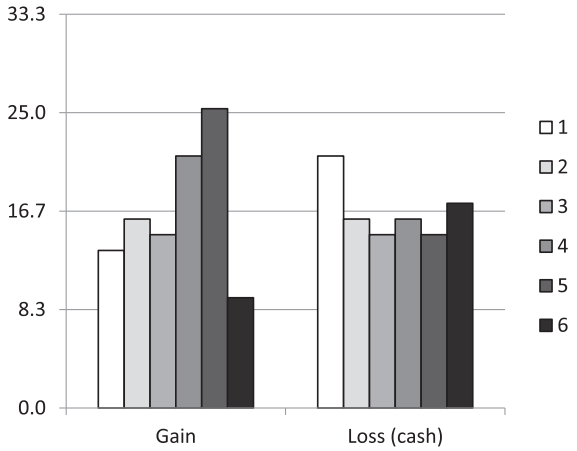

Fig. 1. Reported outcomes (in %) by frame condition in Pre-study 1.

frequently was '6.' This is contrary to findings from studies with certain outcomes. Shalvi, Dana et al. (2011), for example, observed that '6' was reported *most* frequently. In the current experiment, in which reporting a '6' would lead to a certain gain, and thus remove the uncertainty, the outcome '6' has been reported *least* frequently. This result pattern resonates with our hypothesis that participants are more reluctant to lie and report a '6' in the gain domain (which would secure their financial gain), because removing the uncertainty in the ball draw makes external attributions to luck impossible. However, the overall distribution of reported outcomes did not differ from chance in the gain condition, so we cannot unequivocally conclude that participants lied in the gain-frame condition.

We expected that in the loss-frame condition, participants would over-report '6,' thereby removing the risk of losing money. Instead, we did not find evidence for lying in the loss-frame condition. This surprising finding brought into question the procedure used for the study and raises the question why we could not observe clear evidence for lying in our task (also in comparison to many previous studies on the die-roll paradigm). We think of two post-hoc explanation for this unexpected pattern, which both relate to the fact that participants received cash money at the beginning of the experiment. One explanation relates to the closeness vs. remoteness of money. Dishonest behavior is facilitated by extending the psychological distance between the lie and its consequences (Ariely, 2012). Although individuals appeared to restrain themselves from lying when money was given to them prior to performing the task, they did not mind exaggerating their outcomes when merely anticipating receiving payment. Thus, participants who already possess the potential reward might be less likely to lie than participants for whom the reward is more distant or abstract (like an amount of money to be paid at the end of the experiment). Another explanation is that participants might have interpreted receiving money at the beginning of the experiment as a trusting act by the experimenter, which they were motivated to reciprocate by behaving trustworthy themselves. A similar finding was reported by Charness et al. (2019), who speculated that their participants, who were given a cash envelope at the beginning of the experiment, "were perhaps more likely to feel trusted with the full potential payoff in the beginning and might have had different beliefs of the experimenter than people in the corresponding gain treatment" (p. 172). In order to test their and our post-hoc explanation for the absence of lying in the loss condition (with cash) in Pre-study 1, we decided to add an additional condition, in which we describe a loss frame without actually handing out cash to participants at the beginning of the experiment.

4. Pre-study 2

4.1. Method

The experiment was set up to replicate Pre-study 1 and we added a condition in which the decision is framed in terms of losses, but without giving participants cash in the beginning.

Participants and design. A total of 225 first-year students of psychology and pedagogic science ($n = 60$ male and $n = 162$ female, 3 did not report, mean age 21.13 years, $SD = 4.04$)[3] of a Dutch university participated in a laboratory experiment and were randomly assigned to one of three experimental conditions (i.e., gain frame, loss frame with cash, or loss frame without cash).

Manipulation of frames. The gain frame and the loss-frame condition with cash are exact replications of Pre-study 1. Participants in the *loss-frame without cash condition* did not receive €6 in cash but were told that they would start with €6 and the ball draw would

[3] Participants of Pre-Study 1 could not enroll for Pre-Study 2.

determine whether they lose this money. The remaining instructions were identical with the loss-frame condition with cash. Participants in the loss-frame-no-cash condition who drew a winning ball received the €6 in cash after the ball draw.

Dependent measures. We assessed the same measures as in Pre-study 1.[4]

4.2. Results

Table 2 and Fig. 2 display the frequencies with which participants reported each of the six equally likely outcomes of their die roll. Results of Pre-study 2 replicated the main finding of Pre-study 1. There was no evidence for lying in the gain-frame condition [$Chi^2(df = 5, n = 75) = 1.240, p = .941$] and in the loss-frame condition with cash [$Chi^2(df = 5, n = 75) = 5.400, p = .369$]. Note that in the loss-frame condition with cash, a binomial test indicated that the observed proportion of '1' (8.0%) was lower than the expected 16.7% based on chance, $p = .024$ (one-sided). In line with our reasoning that it matters whether the experimenter gives cash to the participants at the start of the experiment, a different picture emerged in the loss-frame condition without cash, where lying occurred, $Chi^2(df = 5, n = 75) = 11.480, p = .043$. Participants reduced the risk to lose money by over-reporting '6' and under-reporting '1' (see Fig. 2). Specifically, binomial tests indicated that the observed proportion of '1' (6.7%) was significantly lower than the expected 16.7%, $p = .009$, and the observed proportion of '6' (28.0%) was significantly higher than the expected 16.7%, $p = .010$ (both one-sided).

Table 2
Reported outcomes by frame condition in Pre-study 2.

	Gain Frame		Loss Frame (cash)		Loss Frame (no cash)	
Reported Outcome	*n*	%	*n*	%	*n*	%
1	10	13.3	6	8.0*	5	6.7*
2	13	17.3	12	16.0	11	14.7
3	13	17.3	14	18.7	10	13.3
4	11	14.7	17	22.7	15	20.0
5	13	17.3	14	18.7	13	17.3
6	15	20.0	12	16.0	21	28.0*
Total	75	100.0	75	100.0	75	100.0

Note. * $p < 0.05$ (one-sided) based on binomial tests.

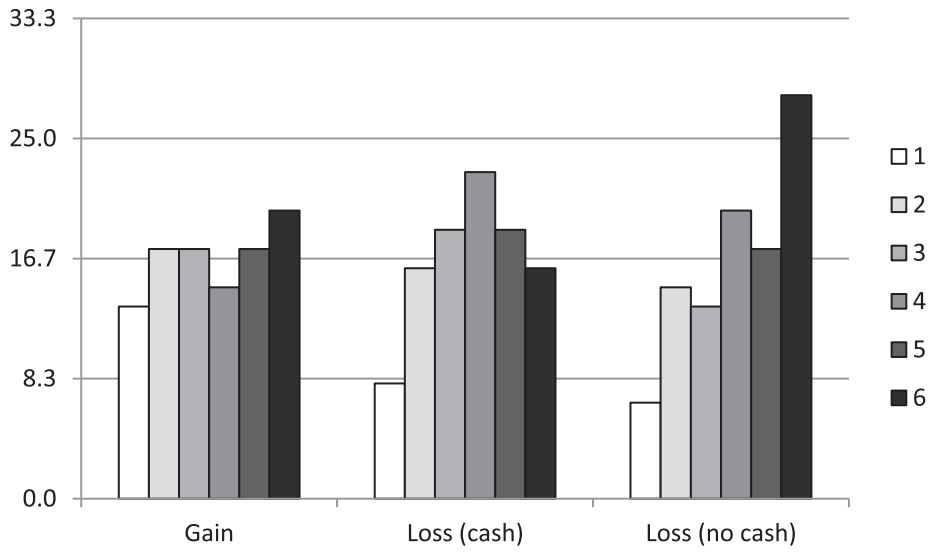

Fig. 2. Reported outcomes (in %) by frame condition in Pre-study 2.

[4] We had a questionnaire with manipulation check questions and questions about potential underlying motives. Participants were asked to fill it in after they had received course credit and, depending on the condition, cash payment, and before the debriefing. Due to a considerably high number of missing values, these data are not reported here.

4.3. Discussion

Pre-study 2 replicated the findings of Pre-study 1 in the gain domain: There was no evidence for lying to increase the chance to win money. Participants did not lie either when they could reduce their risk of losing cash that they received beforehand. Importantly, the loss-frame condition in which participants did not receive cash money at the beginning of the experiment did lead to the predicted results: Participants over-reported sixes, thereby removing the risk of a loss.

The two loss-frame conditions differ in only one respect: Participants in one loss-frame condition received cash money from the experimenter at the beginning of the experiment, while participants in the other loss-frame condition did not receive cash money, but only read that they start with an endowment of €6. We observed no lying among participants who received cash, while we did observe lying among participants who performed exactly the same task without having received cash money. This provides evidence that the physical presence of money or the act of giving cash money beforehand influenced participants' decision to lie or report honestly (see also Charness et al., 2019). To investigate the influence of decision framing, without the confounding effects of presence of money (vs. not), the comparison should be made between the loss-frame condition without cash and the gain-frame condition, in which participants were not given money at the beginning either.

A possible explanation for the low prevalence of lying in the gain-frame conditions of Pre-studies 1 and 2 could be that we recruited a very honest sample. First-year students at a faculty of social sciences might differ in their tendency to lie, either by self-selection or by training, from the sample commonly recruited in prior lying studies, that is, business or economics students (Frank, Gilovich & Regan, 1993). To test whether our sample is particularly honest, we decided to add a non-probabilistic die-roll condition to Pre-study 3, in which participants are paid according to the outcome they report. The purpose of Pre-study 3 thus is to compare our two probabilistic conditions to the standard game with certain payment (e.g., Shalvi, Dana et al., 2011).

5. Pre-study 3

5.1. Method

Pre-study 3 was set up to replicate the gain frame and the loss-frame-without-cash condition and to add a non-probabilistic condition in which participant would receive an amount according to the number they report.

Participants and design. A total of 188 students[5] ($n = 39$ male and $n = 146$ female, 3 did not report, mean age 20.61 years, $SD = 3.39$) of a Dutch university participated in a laboratory experiment and were randomly assigned to one of three experimental conditions (i.e., gain frame, loss frame without cash, or certain outcome condition).

Manipulation of frames. The gain and the loss-no-cash condition were exact replications of Pre-study 2. Participants in the *certain payment condition* were not instructed about a ball draw, but received the standard instruction that they will earn €1 if they roll a '1,' €2 if they roll a '2,' and so on, up to €6 if they roll a '6.'

Procedure. Different from Pre-studies 1 and 2, Pre-study 3 was not advertised as a study into uncertain events. Instead, participants enrolled for an unrelated study on negotiation behavior. Participants read negotiation instructions, and as an incentive, they were told that they could win €6, with their winning chance being dependent on their negotiated outcome. This negotiation study was actually a pilot study, and instead of negotiating, participants filled in a questionnaire about their perception of the upcoming negotiation. They were debriefed about the pilot study after filling in the questionnaire and read that no actual negotiation would take place. To still give them the promised chance to win €6, a die roll was announced. After that, they received the same instructions as in Pre-studies 1 and 2.

Dependent measures. We assessed the report of the die roll, age and gender.

5.2. Results

Table 3 and Fig. 3 display the frequencies of reported outcomes. As in Pre-studies 1 and 2, there was no evidence for lying in the gain-frame condition [$\text{Chi}^2(df = 5, n = 75) = 7.316, p = .198$]. Note that binomial tests indicated that the observed proportion of '1' (7.0%) was significantly lower than the expected 16.7%, $p = .029$, and that the proportion of '3' (26.3%) was significantly higher than the expected 16.7%, $p = .044$ (both one-sided). As in Pre-study 2, we found evidence of lying in the loss-frame condition without cash [$\text{Chi}^2(df = 5, n = 75) = 11.190, p = .048$]. Fig. 3 shows that participants in that condition over-reported '5.' Binomial tests indicated that the observed proportion of '5' (30.2%) was significantly higher than the expected 16.7%, $p = .006$ (one-sided). In the certain payment condition, we also found evidence for lying [$\text{Chi}^2(df = 5, n = 68) = 11.765, p = .038$]. As in prior research (e.g., Shalvi, Dana et al., 2011), '5' and '6' were reported most frequently. Binomial tests indicated that the observed proportion of '1' (7.4%) was significantly lower than the expected 16.7%, $p = .021$, and the proportion of '5' of 27.9% was significantly higher than the expected

[5] $n = 160$ of them were first-year students of psychology and pedagogic science, who participated in the same laboratory in which Pre-studies 1 and 2 were conducted. $n = 28$ were second- and third year students who did a psychology minor at a Liberal Arts College. They participated in a classroom setting, before class started. The experiment in the classroom was conducted by the same experimenters as the lab study and the procedures were the same, except that participants sat in a classroom and filled in the first part of the experiment on their laptops. $N = 23$ students who participated in Pre-study 3 did also participate in Pre-study 2, the other $n = 165$ students did not. Note that Pre-study 2 and Pre-study 3 included the dice roll in a different way (as the central uncertain event in Pre-study 2 vs. a replacement for a negotiation that would otherwise determine the chance to win a price in Pre-study 3) and no deception was used throughout the experiments.

Table 3
Reported outcomes by frame condition in Pre-study 3.

	Gain Frame		Loss Frame (no cash)		Certainty	
Reported Outcome	*n*	%	*n*	%	*n*	%
1	4	7.0*	6	9.5	5	7.4*
2	7	12.3	7	11.1	7	10.3
3	15	26.3*	8	12.7	10	14.7
4	10	17.5	13	20.6	12	17.6
5	11	19.3	19	30.2*	19	27.9*
6	10	17.5	10	15.9	15	22.1
Total	57	100.0	63	100.0	68	100.0

Note. * $p < 0.05$ (one-sided) based on binomial tests.

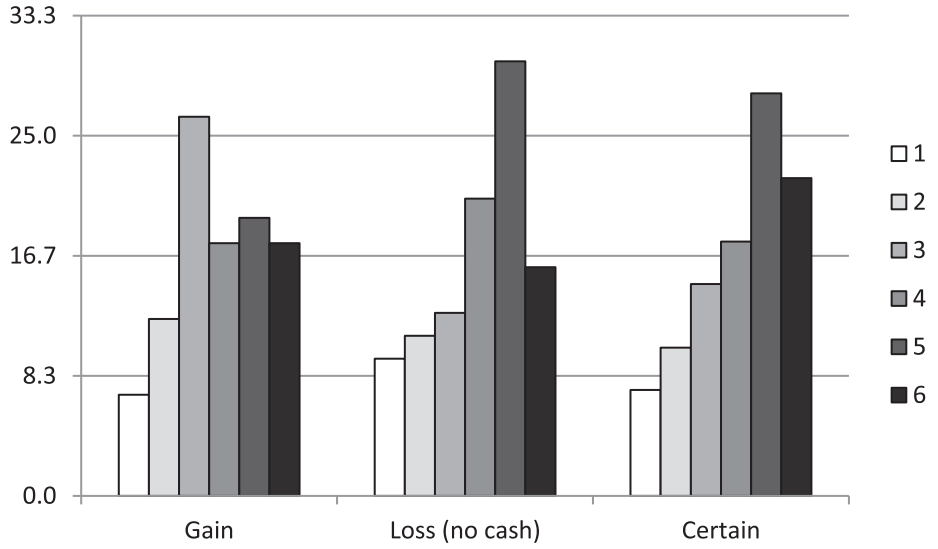

Fig. 3. Reported outcomes (in %) by frame condition in Pre-study 3.

16.7%, $p = .014$ (both one-sided).

5.3. Discussion

In Pre-study 3, we again did not find evidence for lying in the gain-frame condition. In the loss-frame condition without cash, however, we found evidence for lying, albeit this time the '5' was more often reported than '6'. Importantly, we observed a pattern of lying in the non-probabilistic condition, which is largely comparable to the patterns found in earlier studies using the die-under-cup paradigm (e.g., Shalvi, Dana et al., 2011). It is therefore unlikely that the low magnitude of lying in the gain-frame conditions of Pre-studies 1–3, and in the loss frame condition with cash in Pre-study 1 and 2 is solely due to specific sample characteristics.

6. Main study

6.1. Method

In order to find out whether the apparent absence of lying in the probabilistic gain frame is a stable phenomenon, or occurred due to a lack of statistical power in our three pre-studies, we set up the main study to test the effects of a gain vs. a loss frame (without cash) on lying for probabilistic outcomes. We aimed to collect a larger sample compared to the pre-studies to increase the likelihood of detecting lying, and pre-registered[6] a sample size of 120 observations per condition, so that the expected frequency of each actually rolled number would be 20 in each frame condition. Based on Pre-study 3, the effect size for lying, averaged over the gain-frame and the loss-frame condition, is $w = 0.349$. According to G*Power (Faul, Erdfelder, Lang, & Buchner, 2007), the main study would require approximately 106 observations per condition to obtain statistical power at the recommended 0.80 level (Cohen, 1988).

[6] We pre-registered the design, sample size, procedure, method of analysis and the broader hypothesis that more lying is expect in the loss frame than in the gain frame as "Probabilistic Die-Under-Cup in Win or Loss Frame" (#17248) on https://aspredicted.org/ra4k7.pdf.

Participants and design. A total of 240 first-year students of psychology and pedagogic science ($n = 52$ male and $n = 185$ female, 3 did not report, mean age 20.31 years, $SD = 3.19$) of a Dutch university participated in a laboratory experiment and were randomly assigned to one of two experimental conditions (i.e., gain frame, loss frame without cash). Data from four students was removed from the analysis, as they gave an unclear account of their die roll.[7]

Procedure and manipulation of frames. The procedure and manipulation of frames were the same as in the gain and the loss-no-cash condition of Pre-study 3.

Dependent measures. We assessed age, gender and the report of the die roll.

6.2. Results

Table 4 and Fig. 4 display the frequencies of reported outcomes. In this sufficiently large sample, we found evidence for lying in both the gain-frame condition [$Chi^2(df = 5, n = 119) = 14.866, p = .011$] and in the loss-frame condition [$Chi^2(df = 5, n = 117) = 18.744, p = .002$]. Fig. 4 shows that participants in the gain-frame condition most frequently over-reported '5' and under-reported '1'. Binomial tests indicated that the observed proportion of '1' (6.7%) was significantly lower than the expected 16.7%, $p = .001$, and that the observed proportion of '5' (26.1%) was significantly higher than the expected 16.7%, $p = .006$ (both one-sided).

In the loss-frame condition, participants most frequently over-reported '6' and under-reported '1'. Binomial tests indicated that the proportion of '1' (6.8%) was significantly lower than the expected 16.7%, $p = .001$, and that the observed proportion of '6' (28.2%) was significantly higher than the expected 16.7%, $p = .001$ (both one-sided).

We compared the frequency of modest lies (i.e., reports of high outcomes '4' and '5') to major lies (reports of '6'), excluding reports of low outcomes (i.e., '1', '2' and '3') and found a significant effect of frame [$Chi^2(df = 1, n = 151) = 3.91, p = .048$], showing that modest lies were more frequent in the gain frame than the loss frame (54 vs. 43), while major lies were more frequent in the loss frame than the gain frame (33 vs. 21).

7. General discussion

The present work contributes to our understanding of lying in a probabilistic setting. This study examined dishonest behavior when facing potential gains or losses in the presence of uncertainty. In three pre-studies and a main experiment, we used a die-under-cup paradigm, which gave participants the opportunity to lie anonymously by exaggerating the outcome of a die-roll that only they themselves observed. A modification to the usual task was the introduction of uncertainty, in the sense that the outcome of the die roll did not directly translate into the corresponding amount of money (Fischbacher & Föllmi-Heusi, 2013, Shalvi, Dana et al., 2011) but instead increased one's odds of obtaining €6 from a ball draw. This probabilistic setting gives people a "moral wiggle room" to engage in more modest lies (i.e., report a '4' or '5') and attribute a potential positive outcome to luck in the draw rather than to their prior lie.

The finding of our main study is that lying occurred in a probabilistic setting, and that the framing of the decision influences how people lie. When the uncertainty was framed in terms of gains, those participants who reported higher outcomes than they have actually rolled favored more modest lies; they were more likely to report high numbers, in particular '5', but not the highest number '6'. When the uncertainty was framed in terms of losses, however, we found more evidence for major lies; participants were more likely to report the highest number '6'.

Lying in order to remove uncertainty and secure a certain gain seemed less attractive to our participants. This finding fits with our prediction that reporting a '6' is not desirable, as liars would have to attribute the gain to their unethical behavior rather than being able to attribute the resulting gain to luck in the ball draw. Taking this one step further, our participants may have even derived pleasure from participating in a ball draw in which luck determines whether they win money or maintain the status quo. The expected value of this ball draw is already positive, so maybe participants had no desire to further increase their chances through lying.

In a loss frame, participants faced a ball draw in which luck determined whether they lose money or maintain the status quo. The expected value of this ball draw is negative, so participants should not enjoy the gamble by itself, and increasing the chances to obtain a desired outcome may be worth the cost of compromising one's self-concept as an honest individual. Participants may even perceive the fact that the expected value of the gamble is negative as a justification for improving their odds by lying. Resonating with this argument, Cameron et al. (2008) showed that people feel more entitled to lie when facing the prospects of losing money and Grolleau et al. (2016) showed that people lie more under a loss frame as compared to a gain frame. Our findings provide further evidence for lying in the loss frame, although it needs to be noted that our pre-studies suggest that a minor change in the paradigm, such as giving participants cash at the beginning of the experiment, increases honesty (see also Charness et al., 2019 for a similar finding).

Research on lying usually examined situations where dishonesty would provide the liar with desired outcomes with certainty. In real life, however, lying typically has uncertain consequences: Lies often do not directly translate into beneficial outcomes, but rather increase the likelihood of getting a desired outcome. A few studies have investigated uncertainty about the consequences of a lie to the target of the lie (e.g., Dugar, Mitra & Shahriar, 2019; Reinders Folmer & De Cremer, 2012), yet also in these studies, liars would receive desired outcomes with certainty. In a study in which the outcomes of lies were uncertain to the liars themselves, Celse et al. (2019) compared lying in a deterministic baseline condition to several different risk treatments, one six-ball condition in which certainty could be achieved (like the task in the current study) and two conditions with more than six balls (seven and 30), in which certainty

[7] One participant in the gain condition marked 5 and 6. Three participants in the loss-condition marked 1 and 4, 1 and 5, and 1, 2, 3 and 6, respectively. No participant of the Main Study has participated in any of the pre-studies.

Table 4
Reported outcomes by frame condition in the main study.

	Gain Frame		Loss Frame (no cash)	
Reported Outcome	*n*	%	*n*	%
1	8	6.7*	8	6.8*
2	18	15.1	16	13.7
3	17	14.3	17	14.5
4	24	20.2	18	15.4
5	31	26.1*	25	21.4
6	21	17.6	33	28.2*
Total	119	100	117	100

Note. Percentages are valid %, not including four missing values.
*$p < 0.05$ (one-sided) based on binomial tests.

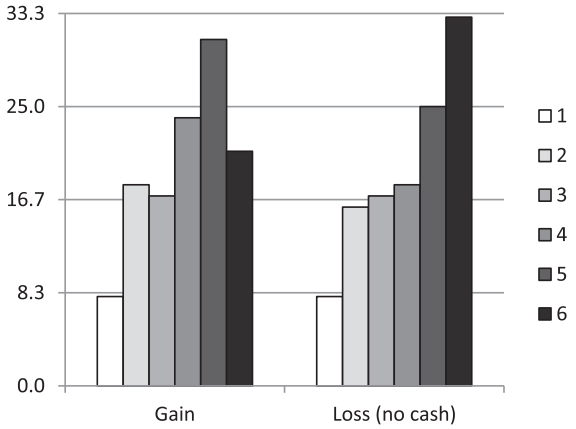

Fig. 4. Reported outcomes (in %) by frame condition in the main study.

could not be achieved. They observed no effect of conditions and concluded that lying to obtain a benefit with certainty is not different to lying to increase the likelihood of achieving a benefit.

The present results replicate Celse et al.'s (2019) findings that lying occurs in probabilistic settings and show that the framing of uncertainty matters. The different patterns of lying in order to achieve a gain or to avoid a loss suggest different motivation for lying under different frames. Major lies reduce uncertainty, yet they come at the price of a harmed self-concept. Modest lies entail the risk of not getting the desired outcome, yet they offer the possibility to attribute beneficial outcomes to luck rather than to one's dishonesty, thereby enabling liars to lie while maintaining a positive self-concept.

Note that Celse et al. (2019) only explored gain-situations, and that the most frequently reported number in the six-ball condition was '5'—as in the gain-frame condition of our Main Study. The most frequently reported number in the conditions in which even a major lie would not fully remove the uncertainty was '6'. This finding resonates with the idea that (at least in a gain frame) decision-makers use lies strategically and leave some uncertainty that allow for self-serving interpretations–attributing the desired outcome to luck rather than to their dishonesty–thereby lying to themselves when lying to others.

7.1. Limitations and directions for future research

A limitation of our studies is that, due to the set-up of the experiments, we have no data to directly test the proposed mediating mechanisms. Neither do we know whether a specific participant has actually lied, nor did we want to administer any questionnaires to understand their motivations behind their choices to not influence participants' decisions.

One interpretation of our findings is classic loss aversion. Based on the assumption that a monetary loss leads to a proportionally higher decrease in subjective value as compared to the increase in subjective value resulting from an equivalent monetary gain, people may lie more to avoid a loss than to secure a gain. Note, however, that loss aversion has been disputed, especially for small stakes. Some studies show that gains may actually "loom larger" than losses for small amounts of money (e.g., Harinck, Van Dijk, Van Beest & Mersmann, 2007; Yechiam, 2019), and that losses affect attention and cognitive effort, which may be an alternative explanation for inaccurate reports in the loss frame (e.g., Leib, Pittarello, Gordon-Hecker, Shalvi & Roskes, 2019; Yechiam & Hochman, 2013a, b).

Another interpretation is simple expected value maximization that may operate differently in losses compared to gains. We explored lying for uncertain (positive or negative) payoffs, yet participants were able to remove the uncertainty by reporting '6.' Reporting a higher die-roll not only decreases the variance of the outcome (i.e., the uncertainty) but also shifts the mean (expected value). People may attempt to maximize expected value, particularly in a loss frame.

However, both loss aversion and expected value maximization, while predicting a shift in the distribution of die-rolls, would not predict the specific pattern of over-reports of '6' in the loss domain and the over-report of '5' in the gain domain. This specific pattern rather resonates with the possibility that concerns of a positive self-concept are weaker in the loss domain, possibly because lying feels more justified in a loss domain where people think they deserve to not "lose their money" rather than when lying to gain money (as outlined above, see also Grolleau et al., 2016; Cameron et al., 2008). However, to clearly disentangle these different underlying explanations, future work should directly compare loss and gain frames in the classic die-roll paradigm with certain outcomes to gain and loss frames using the probabilistic die-roll game as introduced here.

The results from our Main Study, in particular the lying pattern in the loss-no-cash condition of Pre-study 2, and the over-reports of '5' in the gain condition of Pre-study 1, were in line with our predictions. However, overall, we did not find strong evidence for lying in our pre-studies. A possible reason for this is that we recruited fewer participants per condition in the pre-studies. Thus, we might have lacked statistical power to detect lying in the pre-studies. The low prevalence of lying to increase the likelihood of a gain resonates with one finding from a recent meta-analysis suggesting that people lie surprisingly little (Abeler, Nosenzo & Raymond, 2019). While our sample, mostly consisting of psychology and pedagogy students, may be more honest or more stringently adhering to the experimenter's instructions as compared to other samples, we did find evidence for lying in the standard die-roll paradigm in this population (Pre-study 3), similar to previous studies (e.g., Shalvi, Dana et al., 2011).

However, two aspects of the current studies may have undermined participants' desire to lie and increased their chances in the ball draw. First, introducing the ball draw into the paradigm extended the social interaction with the experimenter. Participants might have anticipated that during this extended interaction with the experimenter, it would feel awkward to know that one has lied. Second, we recruited mainly first-year psychology students, who received course credit for participation, regardless of the outcome of the ball draw. As they participated mainly for course credit, increasing the chances of additional cash may have been less tempting. While these aspects might have lowered the base-rate of deception in the current sample, they cannot explain the over-reporting of '5' in the gain frame and '6' in the loss frame. Nevertheless, future studies might employ a paradigm in which social interaction with the experimenter is reduced to the necessary minimum and may use participants who are either not dependent on course credit or, alternatively, make all distributed outcomes contingent on the color of the ball drawn.

Another limitation could be that the prospect of winning (or losing) €6 was simply not important enough for our participants (see also Yechiam, 2019). From informal talks with our participants after they received the money, we gained the impression that €6 is a highly desired windfall, and a considerably higher amount than usually paid in a short experiment like ours (especially, as it was paid on top of course credit). Still, €6 is arguably not an amount of money which makes a substantial change in a student's life. Previous research found that unethical behavior for personal gain tends to increase in the presence of wealth (Gino & Pierce, 2009). However, the amount of money they used was higher than the pay in the present study, so it could be that many of our participants were not tempted enough to lie. In this sense, a possible future direction would be to introduce a higher amount in the design to check whether the majority of individuals will remain honest in general.

It is important to note that, in Pre-study 3, we actually found evidence for over-reporting '5' in the loss-frame condition without cash, which is inconsistent with our prediction and findings in Pre-study 2 and the Main Study. Due to these inconsistencies, we decided to run our Main Study using a larger sample in which we only focused on the gain frame and loss-frame condition, without giving cash prior to the task. This allowed us to test our prediction in a sample that had more statistical power to (a) detect lying and (b) make specific comparisons in the frequency of major and modest lies.

7.2. Theoretical and practical implications

Our study provides further support for the notion that people lie not only in situations where dishonesty directly leads to preferred outcomes, but also when dishonesty merely increases the chances to obtain desired outcomes (Celse et al., 2019). Our finding that major lies prevail in a loss frame, while modest lies prevail in a gain frame further adds to a growing body of research that argues how the prospects of losses may spark unethical behavior (Cameron et al., 2008; Grolleau et al., 2016; Kern & Chugh, 2009; Kirchler & Maciejovsky, 2001; Markiewicz & Czupryna, 2020; Nagel et al., 2020; Pettit et al., 2016; Polman et al., 2020; Robben et al., 1990; Schindler & Pfattheicher, 2017; Schitter & Palan, 2018) and suggests how different motivations, such as the reduction of uncertainty, but also the desire to achieve beneficial outcomes without being responsible for the outcomes of dishonest behavior, form people's choice to engage in dishonest behavior. As a practical implication, these findings suggest several possibilities to discourage people from being dishonest, like framing situations in terms of gains rather than losses and stressing a person's responsibility for the outcome of their actions.

8. Conclusion

When dishonesty is not sanctioned, the decision to lie or not to lie poses a conflict between self-interest and self-concept (Mazar et al., 2008). Often, lying will not secure a desired outcome, but will instead only increase the odds of obtaining it. The current work contributes to our understanding of dishonest behavior in the face of uncertain gains as opposed to losses. We found evidence that the framing of the situation influences the choices people make in the conflict between self-interest and self-concept. In order to avoid suffering a loss, liars are willing to tell major lies, while in order to achieve a gain, liars stick to more modest lies, trying to increase their chances, while still keeping some uncertainty, which may mitigate their feeling of responsibility in case the benefit is obtained.

9. Authors note

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Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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