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REGISTERED REPORT STAGE 1: STUDY DESIGN

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Registered report: The effects of incentivized lies on memory

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Abstract

The proposed experiment will examine the effect of deceptive behavior on memory. Participants will be assigned to a "strong-incentive to cheat" or "weak-incentive to cheat" condition and play the adapted Sequential Dyadic Die-Rolling paradigm. Specifically, Player A (computer; participants think it is another participant) throws a die and reports it to Player B (participant). Then Player B throws his/her die, remembers the outcome, and reports it to Player A. Participants in the "strong-incentive to cheat" condition are monetarily punished if their die roll outcome differs from Player A's die roll outcome. Participants in the "weak-incentive to cheat" condition are not punished if the die roll outcomes differ. Two-days later, memory for the die-rolling event will be assessed. We predict that participants in the "strong-incentive to cheat" condition will have lower belief and recollection for the die-rolling event and will report more errors than participants in the "weak-incentive to cheat" condition.

KEYWORDS
deception, memory, lying, unethical amnesia

1 | INTRODUCTION

Avoiding punishment is one of the reasons why people lie in investigations and, ultimately, in the courtroom. But what happens to memory for events that have been lied about when the purpose of the lie is to avoid punishment? Take for instance the case of Alfred Dewayne Brown (Innocent Project, 2020). Brown was arrested for a store robbery during which a cashier and police officer were killed. Two accomplices, named Dashan Glaspie and Elijah Joubert, claimed that Brown was the shooter (Possley, 2015). In exchange for his testimony, Glaspie avoided the death penalty and received a 30-year prison sentence. Additionally, Alfred's girlfriend, Ericka Dockery, testified that Brown confessed to the crime while under the threat of losing custody of her children. Even though shortly after the conviction Joubert and Dockery recanted their statements and admitted that these were false testimonies, new evidence was necessary to exonerate Brown. The recanted statements were deemed unreliable (Possley, 2015; Innocence project, 2020). A crucial question underpinning cases such as the one described here is whether memories about an experienced event become adversely affected after having lied about the event? More specifically, does engaging in deceptive behaviors to avoid punishment lead to memory impairing effects? This is the focus of the current experiment.

1.1 | Forced confabulation and memory

Empirical research in the memory and deception domain suggest that lying can have adverse effects on memory (Otgaar & Baker, 2018). In this experiment, we will specifically examine the effects of confabulations on memory. One method to study the effects of confabulations on memory was developed by Ackil and Zaragoza (1998) and is known as the forced confabulation paradigm. In this paradigm participants watch a short video about a boy's experience in a summer camp and are later interviewed about details in the video. A crucial element of this interview is that participants are additionally questioned about details that never occurred in the video. Before the interview, participants are divided into two groups: the forced confabulation and control group. The forced confabulation group has to answer all questions and guess when uncertain, while the control group has to answer only when they are certain and avoid guessing. After a one-week delay, participants' memory is examined using a source-monitoring test. Previous research using the forced confabulation paradigm has consistently shown that participants formed false memories for their confabulations (Ackil & Zaragoza, 1998, 2011; Chrobak & Zaragoza, 2008, 2013; Drivdahl & Zaragoza, 2001; Hanba & Zaragoza, 2007; Otgaar et al., 2014; Pezdek et al., 2007, 2009; Zaragoza et al., 2001).

Numerous studies have examined variables that can inflate the forced confabulation effect (Hanba & Zaragoza, 2007; Pezdek et al., 2007, 2009; Zaragoza et al., 2001). One variable that has been examined is confirmatory interviewer feedback. In studies using this type of feedback (Hanba & Zaragoza, 2007; Zaragoza et al., 2001), participants followed similar steps as in the forced confabulation paradigm. However, the forced confabulation group additionally received confirmatory interviewer feedback (e.g., "That's right, _____ is the correct answer") or neutral interviewer feedback (e.g., "____, O.K.") expressed in a monotone voice for the details that did not occur in the video. The findings showed that confirmatory interviewer feedback not only led to false memories for confabulated items after a one-week delay, but also increased the participants' persistence and confidence in their false memories (Hanba & Zaragoza, 2007; Zaragoza et al., 2001). This suggests that there is a specific social-motivational factor that can enhance the forced confabulation effect.

Another variable that impacts the forced confabulation effect is whether the confabulation is forced or voluntary (Pezdek et al., 2007, 2009). To examine this issue, Pezdek and colleagues had participants watch a video of a car-jacking and then gave them 16 answerable and six unanswerable questions about the video. All participants received instructions to answer all questions. However, half of the participants had the option to indicate "I do not know". A week later, the memory for the video was assessed through the same 22 questions but now all participants received the "I do not know" option. The forced confabulation effect was detected for participants who did not have the "I do not know" option available in the initial test. Interestingly, participants who confabulated a response for unanswerable questions when the "I do not know" option was available were more likely to repeat that answer at the second memory test relative to participants who were forced to confabulate during the first memory test. This effect increased when participants were questioned and forced to fabricate multiple times about details in the video (Pezdek et al., 2007). These findings suggest that when participants voluntarily self-generate an answer to unanswerable questions, they are more likely to produce persisting false memories than when the responses are forced (Pezdek et al., 2007, 2009). That is, if people voluntarily self-generate misinformation, it is more likely that this misinformation will be incorporated into memory in comparison to people who are forced to self-generate misinformation. Taken together, the social-motivational role of confirmatory interviewer feedback and whether misinformation was voluntarily self-generated seem to increase the forced confabulation effect (Hanba & Zaragoza, 2007; Pezdek et al., 2007, 2009; Zaragoza et al., 2001).

1.2 | Self-generated deceptive behavior and memory

In a recent study, a different approach was used to examine the effects of confabulations on memory (Kouchaki & Gino, 2016). Specifically, in this study, the authors examined the memory impairing effects caused by self-generated deceptive behavior for monetary rewards. In their experiment, participants played a die-rolling game wherein they threw a die 20 times. Each die roll counted for points which later was converted into money. Higher die rolls led to increased earnings for the participant. Before each die roll, participants had to indicate whether they wanted the top side (visible) or down side (invisible) to count. That is, if a participant chose the down side of the die roll to count and then threw the number "3," he/she received 4 points because the number "4" was on the down side of the die. If the participant chose the top side of the die roll to count and then threw the number "3," he/she received 3 points. Critically, half of the participants had to explicitly report which side they wanted to count before throwing the die (no-cheating condition), while the other half of participants could decide it mentally (likely-cheat condition) and were permitted to keep this decision to themselves. After a two-day delay, participants were asked to think back to the die-rolling task and completed the Autobiographical Memory Questionnaire via a 7-point Likert scale (*1 = strongly agree, 7 = strongly disagree*) (AMQ; Rubin et al., 2003). The AMQ measures recollection and belief for autobiographical memories via questions assessing visual imagery, auditory imagery, emotions, and exact knowledge regarding the memory (e.g., "as I think about the task, I can actually remember it"). Kouchaki and Gino (2016) found that participants in the likely-cheating condition scored lower on the AMQ for the die-rolling task compared with participants in the no-cheating condition. This effect has been termed *unethical amnesia*. *Unethical amnesia* specifically refers to situations in which engaging in deceptive behavior leads to lower recollection and belief of an experienced event (Kouchaki & Gino, 2016; but see also Stanley et al., 2018). However, memory accuracy for the die rolling game itself was not examined. In the current experiment, we will examine the effects of *unethical amnesia* in an adapted paradigm. Additionally, we will assess whether engaging in deceptive behaviors affects the memory for the event itself.

One possible underlying mechanism of *unethical amnesia* is motivated forgetting (Anderson & Hanslmayr, 2014). Motivated forgetting essentially refers to an active attempt to forget unwanted experiences, such as behaving inappropriately (e.g., cheating on an exam). Research demonstrated that instructing participants during encoding to forget items, compared to instructions to remember, can lead to forgetting of the to-be-forgotten items (MacLeod, 1998). This type of forgetting is termed directed forgetting. Similar forgetting effects have also been reported when participants are instructed to forget items at retrieval (Anderson & Green, 2001). Taken together, these findings suggest that consciously forgetting specific experiences can lead to memory impairing effects.

With respect to motivated forgetting, when a person's behavior does not align with their perceived self-image (e.g., as an honest person), it can lead to an individual actively forgetting their past behavior, resulting in similar memory undermining effects as directed forgetting (Anderson & Hanslmayr, 2014; Kouchaki & Gino, 2016). Take for instance the hypothetical case of Elsa. Elsa is an honest student who, however, has now cheated on an exam to get a higher grade. This dishonest behavior threatens her moral self-image which motivates her to actively forget the dishonest behavior. When Elsa actively tries to forget her dishonest behavior, the memory for it fades, although the memory for unrelated ethical details such as the content of the exam will not. Hence, the idea of motivated forgetting is that actively trying to forget past dishonest behavior leads to memory undermining effects for the dishonest act. However, the memory for details unrelated to their ethical behavior might remain intact (Anderson & Hanslmayr, 2014; Kouchaki & Gino, 2016; Shu et al., 2011).

1.3 | The current experiment

The primary goal of our experiment is to examine whether voluntary self-generated deceptive behavior, motivated by punishment avoidance, has contaminating effects on memory. Hence, we aim to replicate the results of Kouchaki and Gino (2016) where recollection and belief for the die rolling event was lower for the participants who engaged in deceptive behaviors compared to participants who did not. To study the adverse effects of deceptive behavior on memory, participants will play an adapted version of the Sequential Dyadic Die-Rolling paradigm (Weisel & Shalvi, 2015). Usually, in this paradigm, participant A (computer in our experiment although participants think it is another participant) anonymously rolls a die and then reports the corresponding number to participant B (participant). After participant B receives the reported die roll, participant B anonymously rolls a die and then reports the outcome to participant A. A standard finding is the disproportional high numbers of identical reports when rewarding outcomes that were aligned (e.g., if both reported number 5, both received 5 euros) (Weisel & Shalvi, 2015; Wouda et al., 2017). This result is in line with other literature showing that a negative aspect of collaboration is an increased tendency towards dishonest behavior (Conrads et al., 2013; Kocher et al., 2018; Wouda et al., 2017). In the present experiment, we will adapt the Sequential Dyadic Die-Rolling paradigm for two reasons. First, in the adapted version, participants will not be able to earn monetary rewards but can avoid monetary deductions when engaging in collaborative deceptive behavior. This modification of the Sequential Dyadic Die-Rolling paradigm reflects more accurately the incentives suspects or eyewitnesses have in the courtroom to lie, which is to avoid punishment. Additionally, it has been demonstrated that avoiding a loss is a stronger incentive to behave dishonestly than gaining rewards (Schindler & Pfattheicher, 2017). Second, the adapted version allows us to observe what the participants actually threw and reported at an individual level. Having this behavioral ground truth enables us to examine the effects of lying on the memory accuracy for the event instead of solely the memory experience, as was the case in the studies on unethical amnesia (Kouchaki & Gino, 2016).

Specifically, to examine the effects of self-generated deceptive behavior, driven by punishment avoidance, on memory, we will randomly assign participants to either a "strong-incentive to cheat" condition or the "weak-incentive to cheat" condition. Participants in both conditions will receive five euros in their "bank" at the start of the experiment. In the "strong-incentive to cheat" condition, participants will be punished through monetary deductions if the reported numbers are not equivalent (i.e., aligned outcomes). In the "weak-incentive to cheat" condition participants are instructed to throw, remember, and report the die roll outcome and are told that only the other participant will receive 1 point if their reported numbers are equivalent. After a two-day delay, we will examine all participants' memory experience for the die rolling event via the AMQ (Rubin et al., 2003). Additionally, we will assess a specific die roll memory questionnaire regarding the thrown and reported die rolls (i.e., "how many times did you throw/report each number?"; "what was the color of the thrown/reported die?") (see Appendix B). According to the notion of motivated forgetting, behaving dishonestly can cause people to actively try to forget that behavior, leading to impoverished memory for such act (Anderson & Hanslmayr, 2014). Hence, we predict that participants in the "strong-incentive to cheat" condition will have lower recollection and belief for the die rolling event and perform worse on the specific die roll memory accuracy questions. That is, we expect to replicate the unethical amnesia effect and predict to observe higher incorrect recall of thrown and reported die rolls.

1.4 | Hypotheses

1. We predict that participants in the "strong-incentive to cheat" condition will have lower recollection and belief scores for the die-rolling task on the Autobiographical Memory Questionnaire (Rubin et al., 2003) compared with participants in the "weak-incentive to cheat" condition.
2. Additionally, we predict that the magnitude of the errors on the specific die roll memory accuracy questions will be greater for the "strong-incentive to cheat" condition compared with the "weak-incentive to cheat" condition. The magnitude of errors is defined by the difference between the amount of times a participant actually threw/reported a number and the amount they remembered having thrown/reported a number.

1.5 | Pilot study

In a pilot study, we examined whether our manipulation (i.e., punishment avoidance) led to more cheating for participants in the "strong-incentive to cheat" condition than participants in the "weak-incentive to cheat" condition in the adapted Sequential Dyadic Die-Rolling paradigm. We also examined the effectiveness of our procedure through participants' self-reported experiences. We expected that more participants in the "strong-incentive to cheat" condition would lie and would do so more frequently than participants in the "weak-incentive to cheat" condition.

2 | METHOD

2.1 | Participants, materials, design, and procedure

For the pilot study, we recruited 50 participants (M_{age} = 41.1, SD = 12.9, range: 23–70; 26 males) via Amazon Mechanical Turk (MTurk). The pilot study was a one-session study and took on average 16.3 minutes (SD = 6.2 min). All participants were rewarded with five dollars for their participation, regardless of their performance on the adapted Sequential Dyadic Die-Rolling paradigm. None of the participants failed the attention checks (i.e., "What did Jamie_1789 throw"). The experiment was conducted online via Qualtrics. Data are available on the Open Science Framework (OSF; https://osf.io/u2nhv/?view_only=93e980bcc68449ada41b411d0ed9751b).

Participants took part in the adapted Sequential Dyadic Die-Rolling paradigm (see Materials for Current Experiment) and completed Part 1 (see Procedure for Current Experiment). Qualtrics randomly assigned participants to either the "strong-incentive to cheat" condition (n = 24) or the "weak-incentive to cheat" condition (n = 26). After completing the adapted Sequential Dyadic Die-Roll paradigm, participants were asked to rate their agreement/disagreement on a 7-point Likert scale (1 = *strongly agree*, 7 = *strongly disagree*) for the following five statements: (i) whether participants agreed that their die roll was completely anonymous – only they could know what they rolled, (ii) whether they agreed that they played with another participant, (iii) whether they thought the die roll was fair (completely random, like a real die), (iv) whether they suspected that the researchers would check whether they cheated during the die roll game, and lastly (v) whether they cheated in the die rolling game.

The number of lies told was calculated by examining the number of times participants' die roll reports were different from what they actually threw and whether their report was the required number to avoid monetary deduction (i.e., "strong-incentive to cheat" condition) or to give the other participant (i.e., Jamie_1789) 1 point (i.e., "weak-incentive to cheat" condition). A participant was classified as a liar when they lied at least once.

3 | RESULTS AND DISCUSSION

The aim of the pilot study was to examine whether participants would engage in deceptive behavior to avoid punishment. Our findings showed that, overall, 41.6% (10/24) of participants in the "strong-incentive to cheat" condition lied to avoid punishment. In total, participants in the "strong-incentive to cheat" condition lied 120 times. In contrast, 23% (6/26) of participants in the "weak-incentive to cheat" condition lied to give the other participant (i.e., computer) a point. In the "weak-incentive to cheat" condition participants lied 68 times in total.

We also examined the effectiveness of our manipulation through participants' self-reports. We found that overall participants agreed that their die roll was completely anonymous – only they knew what they rolled (62%; 31/50) (M = 3.10, SD = 1.98). Also, 88% (44/50) of participants agreed that the die was fair (completely random, like a real die) (M = 2.18, SD = 1.21). Ninety percent (45/50) of participants agreed that they played with another participant (M = 1.86, SD = 1.29). Participants were divided as to whether researchers were going to check if they cheated in the die roll game: 44% (22/50) agreed, 24% (12/50) neither agreed nor disagreed, and 32% disagreed (M = 3.92, SD = 1.95). Finally, we found that 56.3% (9/16) of participants admitted that they engaged in deceptive behavior when they cheated (M = 5.68, SD = 2.08).

Taken together these results suggest that avoiding punishment can lead to higher rates of deceptive behavior and that our manipulation thus was successful. However, there were participants in the "strong-incentive to cheat" condition who remained honest even if they were punished. A possible explanation for participants remaining honest is that a considerable number of participants were aware that their die rolls were going to be checked. Hence, it is possible that this awareness made participants behave in a more socially desirable manner, reducing the amount of cheating observed in the "strong-incentive to cheat" condition. As an exploratory aim of the current experiment, we will examine whether in the main experiment, such honest participants will be present as well in the "strong-incentive to cheat" condition. If so, we will use the honest participants of the "strong-incentive to cheat" condition as an additional control condition. Specifically, we will examine the adverse memory effects between participants in the "strong-incentive to cheat" condition that engaged in deceptive behavior and those who did not. Finally, we will conduct exploratory analyses to examine whether cheating for selfish reasons (e.g., avoiding punishment) impacts memory differently as compared with cheating for prosocial reasons (e.g., giving the other participant 1 point without any personal benefit).

4 | CURRENT EXPERIMENT

4.1 | Method

4.1.1 | Participants

A Bayes Factor Design Analysis (BFDA; Schönbrodt & Wagenmakers, 2018; Schönbrodt & Stefan, 2018) for a directional Bayesian t-test was performed to determine the sample size. We aimed for compelling strength of evidence of six. That is, our BFDA fixed-N design was based on a $BF_{10} = 6$ meaning that we based our sample size calculation on whether we can obtain substantial evidence that the alternative hypothesis is six times more in favor than the null hypothesis, if there is indeed an effect. We decided to use a $BF_{10} = 6$ to detect, at the least, solid moderate evidence in favor of the alternative hypothesis (Lee & Wagenmakers, 2014; Schönbrodt & Wagenmakers, 2018). We used a cautionary expected effect size ($d = 0.5$) based on the study by Kouchaki and Gino (2016) where they found an effect size $d = 0.57$. With a probability of 0.90 and a default Cauchy $\sqrt{2}/2$ prior distribution for the alternative hypothesis, the BFDA indicated that we require a total sample size of 238 participants.[1] Participants will receive a monetary reward in the form of a voucher. Amount of the monetary reward depends on their performance in the Sequential Dyadic Die-Rolling paradigm (max = 7 euro). Participants will be recruited from KU Leuven via flyers, advertisements, and the SONA System.

The experiment was approved by the Social and Societal Ethics Committee from the KU Leuven (G-2020-2151-R2[MAR]). Also, the experiment will be preregistered on the Open Science Framework (OSF) and the materials and raw data will be made available at the OSF (TBD).

4.1.2 | Materials

Sequential Dyadic Die-Rolling Paradigm (adapted). The Sequential Dyadic Die-Rolling paradigm (Weisel & Shalvi, 2015) will be adapted for the current experiment and is focused on the aligned outcomes condition. The adapted paradigm for the "strong-incentive to cheat" condition goes as follows: Player A (i.e., computer) throws a die and reports it to Player B (actual participant). However, participants are told that they are playing the die rolling game with another participant. To ascertain that participants in both conditions are attentive to the task, hence remembering the reported die roll, they will receive a follow-up question about the reported number of Player A. Then Player B throws the die anonymously, remembers the outcome, and reports it back to Player A. This procedure is repeated 20 times. At the start of the experiment, participants will start with five euros each in their "bank." If participants report the same number as Player A, there will be no deductions from the five euros in the "bank." If they do not report the same number as Player A, 25 cents will be deducted (20 × 0.25 = 5 euro) (see Figure 1). Participants in the "weak-incentive to cheat" condition are informed that they have to throw the die, remember the outcome, and report it to Player A. If they report the same number as Player A, then only Player A will receive 1 point. If they do not report the same number as Player A, then Player A receives 0 points. This experiment will be conducted online via Qualtrics permitting us to establish the ground truth of the actually thrown and reported die rolls by the participants. Using JavaScript, we created a die roll game in Qualtrics through which we can track what the participants actually threw and reported.

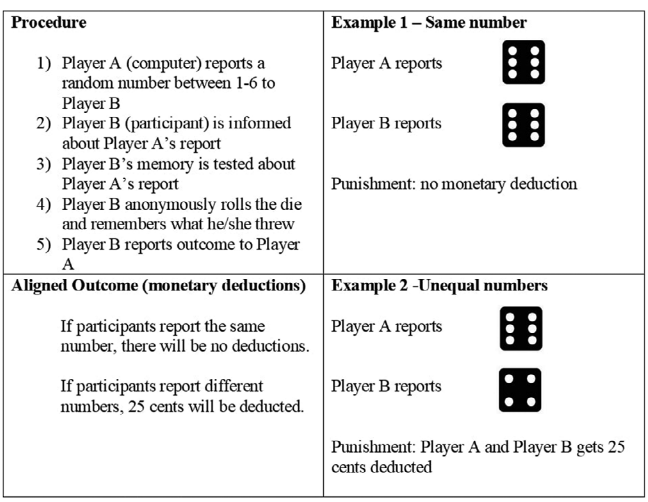

FIGURE 1 Procedure of the experiment

Autobiographical Memory Questionnaire. After a two-day delay, participants receive six questions of the autobiographical memory questionnaire (AMQ; Rubin et al., 2003; Kouchaki & Gino, 2016) (see Appendix A). The AMQ measures recollection and belief in autobiographical memories via questions assessing visual imagery, auditory imagery, emotions, and exact knowledge regarding the memory. The questions will be rated on a 7-point Likert scale (*1 = strongly agree*, *7 = strongly disagree*).

Specific Die Roll Memory Questionnaire. Along with the AMQ, the participants have to answer two estimation questions assessing the participants' memory for the die rolls (i.e., "how many times did you throw each number?"). Additionally, participants' memory for the color of the die when throwing and reporting the die rolls is tested (i.e., "what was the color of the thrown die?") (see Appendix B).

4.2 | Design and procedure

This experiment will use a between subject design (Condition: strong-incentive to cheat vs weak-incentive to cheat). The dependent variables are the 7-point Likert scale scores on the six questions of the AMQ and the amount of errors on the specific die roll memory accuracy questions. Participants will be randomly assigned to either one or the other condition. The experiment will be designed via Qualtrics and will be performed online. The experiment will consist of two parts. Part 1 will be the adapted Sequential Dyadic Die-Rolling Paradigm. Part 2 will take place after a two-day delay and will consist of two memory tests.

Before the experiment starts, participants will be requested to give their informed consent to participate in the study. All participants will first answer some demographical questions and then check whether the throwing die was fair (completely random, like a real die). To increase the feeling for participants that they are playing with another human being we will ask them to enter a username. Moreover, they will be told to wait until we connect them with another participant and after 15–30 sec, participants are informed that they are going the play the die roll game with Jamie_1789 (i.e., computer). Then, Qualtrics will randomly assign them to either the "strong-incentive to cheat" or "weak-incentive to cheat" condition. Participants in the "strong-incentive to cheat" condition will receive the following instructions: "*. You will play a die rolling game with Jamie_1789. Both you and Jamie_1789 have already received five euros to play the game – this money is in your "bank". The game is played as follows: Jamie_1789 will first anonymously roll a die and remember the number he/she threw. Jamie_1789 will report this number to you. Then you will be shown what Jamie_1789 reported. Subsequently, you will anonymously throw a die. You will have to remember what you threw. You will have to report this number. Jamie_1789 will be informed of your reported* *number. Performance on the die rolling task can lower the amount of money in your "bank" (see table below). If you report identical numbers, there will be no deductions of your five euros in the "bank"(for example, both Jamie_1789 and you reported the number 4). If you report a different number than Jamie_1789, then both of you will be deducted 25 cents of your already earned 5 euros. In total you will throw the die and report the number 20 times. We will start with 5 practice trials for you to understand the game. These practice trials have no consequences for your already earned 5 euros. After the practice trials the experiment will start. The die rolls are completely anonymous*".

Participants in the "weak-incentive to cheat" condition will be given the following instructions: "*You will play a die rolling game with Jamie_1789. Both you and Jamie_1789 have already received five euros for participating in Part 1 of the experiment – this money is in your "bank". The game is played as follows: Jamie_1789 will first anonymously roll a die and remember the number he/she threw. Jamie_1789 will report this number to you. Then you will be shown what Jamie_1789 reported. Subsequently, you will throw anonymously a die. You will have to remember what you threw. You will have to report this number. Jamie_1789 will be informed of your reported number. Performance on the die rolling task can give Jamie_1789 points (see table below). If you report identical numbers, Jamie_1789 gets 1 point (for example, both you and Jamie_1789 reported the number 4). If you report a different number than Jamie_1789, then Jamie_1789 will receive 0 points. In total, you will throw the die and report the number 20 times. We will start with 5 practice trials for you to understand the game. These practice trials do not count yet for points. After the practice trials the experiment will start. The die rolls are completely anonymous*". Afterwards, participants will be informed that they will receive a link after 48 hours wherein they will have to complete Part 2 of the experiment. Qualtrics will automatically send out the links after 48 h. Participants will be informed that if they do not respond within 24 h of receiving the link, they will be unable to partake in Part 2 of the study. To ensure that participants complete both parts of the study, participants will be told that they will receive payment on completion of Part 2.

Part 2 takes place 48 h after completion of Part 1. The second part of the experiment will also be conducted online. Part 2 consists of the six questions from the AMQ and four specific die roll memory questions. Participants will be informed that for each specific die rolling memory question, they will earn 50 cents for each correct answer. For the estimation questions, participants are told that they threw the die in total 20 times and their accuracy is based on how well they remember the distribution of these 20 die rolls and that there is an accepted margin of error of 20%. The accuracy rewards were included to stimulate participants' accuracy and to encourage the reporting of truthful responses from memory.[2] Hence, in total participants will be able to earn seven euros for completion of the experiment. Participants will have to answer 10 questions about their memory for die rolls during the game in Part 1. Lastly, we will ask the participants a question regarding the intent of the study (i.e., "In your opinion, what was the aim of the study?"). Afterwards participants will be thanked and debriefed.

5 | DATA ANALYSIS PLAN

5.1 | Manipulation check

Before conducting the main statistical analyses, we will first examine how many participants cheated in each condition ("strong-incentive to cheat" vs. "weak-incentive to cheat") and how many times they did so. This step will shed light on the strength of our manipulation, and may be an explanatory factor in case we fail to find evidence for an effect of self-generated lies on memory. Additionally, these analyses will determine the number of participants cheating for selfish reasons (e.g., punishment avoidance), for pro-social reasons (e.g., giving a point to the other participant without any personal benefit), and the number of participants that remained honest despite such incentives to cheat.

5.2 | Hypothesis 1

Statistical analyses will be performed between the "strong-incentive to cheat" condition and the "weak-incentive to cheat" condition on the following two dependent variables: mean AMQ scores and amount of specific die roll errors. The AMQ scores are based on six questions wherein participants indicate on a 7-point Likert scale their recollection of the event. To assess the internal consistency of the AMQ scores, Cronbach's alpha and Omega coefficient will be calculated. Scores will be averaged across all six questions if coefficient Omega >.65. Then we will perform a Bayesian t-tests with a default Cauchy $\sqrt{2}/2$ prior distribution in the direction that the "strong-incentive to cheat" condition will score lower on the AMQ than the "weak-incentive to cheat" condition, as seen in the study by Kouchaki and Gino (2016). Along with the directional Bayesian *t*-test with we will perform an analogous frequentist analysis, namely the Welch's independent sample *t*-test. For the Welch's independent sample *t*-test the following values will be reported: *t*, degrees of freedom, *p*, Hedges' *g* and its 95% confidence interval. *g* Our Bayes Factor Design Analysis is based on finding compelling strength of a $BF_{10} > 6$ in favor of the alternative hypothesis. Hence, we will consider our hypotheses supported when the $BF_{10} > 6$. However, if BF_{10} is between 3 and 6 we will consider the hypotheses supported with weak evidence. Additionally, we will consider that our hypotheses are supported from a frequentist viewpoint when $p < .05$.

5.3 | Hypothesis 2

We will conduct a statistical analysis to examine the magnitude of the specific die roll errors. For this analysis, the two estimation questions of the specific die rolling questions are used (i.e., how many times did you report/throw each number?). The answers to the estimation questions are compared to the ground truth of how many times they actually threw and reported each number. As for before, the ground truth can be tracked for each participant individually via Qualtrics. To examine the magnitude of the specific die rolls errors, we will measure how far off the memory of the thrown or reported die roll was compared to what they actually threw or reported. For instance, when a participant threw the number "6" six times but indicated on the memory test that he/she remembers throwing the number "6" only one time. This would be an error of greater magnitude compared to when a participant remembered throwing the number "6" five times. Hence, the difference between what was actually reported or thrown and what was indicated on the memory task is used as the indicator for the magnitude of an error. For instance, if a participant threw number "6" four times, but indicates on the memory task that he/she threw the number "6" only two times, then it is scored as two errors. Participants can have a maximum of 80 errors on the two estimation questions.

Based on these two different scores we will run a directional Bayesian *t*-test with a default Cauchy √2/2 prior distribution wherein we expect the "strong-incentive to cheat" condition to have errors of greater magnitude on the specific die roll questions compared to the "weak-incentive to cheat" condition. This is, we expect deceptive behavior motivated by punishment avoidance to impair memory accuracy. Along with the directional Bayesian *t*-test we will perform an analogous frequentist analysis, namely the Welch's independent sample *t*-test. For the Welch's independent sample *t*-test the following values will be reported: *t*, degrees of freedom, *p*, Hedges' *g* and its 95% confidence interval. Our Bayes Factor Design Analysis is based on finding compelling strength of a $BF_{10} > 6$ in favor of the alternative hypothesis. Hence, we will consider our hypotheses supported when the $BF_{10} > 6$. However, if BF_{10} is between 3 and 6 we will consider the hypotheses supported with weak evidence. Additionally, we will consider that our hypotheses are supported from a frequentist viewpoint when $p < .05$.

5.4 | Exclusion criteria

The exclusion criteria are as follows: (i) if participants do not respond to the memory task within 24 h of sending the link, (ii) if they make more 4 or more errors on the practice trials (before experiment starts), (iii) if participants fail to correctly answer 4 out of the 20 attention checks correctly throughout the experiment (i.e., "What did Jamie_1789 throw?"), and (iv) if participants identified the true aim of the study.

CONFLICT OF INTEREST

The author(s) declared that there were no conflicts of interest with respect to the authorship or the publication of this article.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are openly available on the Open Science Framework at https://osf.io/u2nhv/?view_only=93e980bcc68449ada41b411d0ed9751b.

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ENDNOTES

[1] From a frequentist perspective, a sensitivity analysis concluded that based on the planned sample size with 90% power, we are able detect an effect size as small as $d > .38$. However, it is beyond our resources to collect the sample size for our Bayesian data analysis for an effect size $d = .38$ ($N = 386$). However, we believe that our planned sample size ($N = 238$) allows us to find convincing evidence when the effect is indeed $d = .5$ or larger through the Bayesian and frequentist data analyses, while also able to detect smaller effects ($d = .38$) with high power (90%) using the frequentist approach.

[2] All participants received the accuracy reward, regardless of their scores.

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APPENDIX

A: Autobiographical Memory Questionnaire (Kouchaki & Gino, 2016)

Instructions: Please think back to the die throwing task you completed during Part1 of the study. The following questions ask you about that task.

Please indicate your agreement with each of them.

1. As I think about the task, I can actually remember it.
   a. 1 = strongly agree, 7 = strongly disagree
2. As I remember the task, I can feel now the emotions that I felt then.
   a. 1 = strongly agree, 7 = strongly disagree
3. Overall, I remember this event.
   a. 1 = strongly agree, 7 = strongly disagree
4. My memory of this event is dim
   a. 1 = strongly agree, 7 = strongly disagree
5. I remember how I felt at the time I just recalled
   a. 1 = strongly agree, 7 = strongly disagree
6. I remember what I thought at the time of the event I just recalled.
   a. 1 = strongly agree, 7 = strongly disagree

B: Specific die rolling questions

For the following questions you will be rewarded for accuracy. This means that for every correct answer you will receive $0.50. There are four questions in total (4 × $0.50 = $2). Please respond honestly to all questions.

1. What was the color of the **thrown** die?
   a. Red
   b. Black
   c. Yellow
   d. White
2. How many times did you **throw** each number? (total = 20)
   a. 1 =
   b. 2 =
   c. 3 =
   d. 4 =
   e. 5 =
   f. 6 =
3. What was the color of the **reported** die?
   a. Red
   b. Black
   c. Yellow
   d. White
4. How many times did you **report** each number? (total = 20)
   a. 1 =
   b. 2 =
   c. 3 =
   d. 4 =
   e. 5 =
   f. 6 =

C: Questions used in pilot study

1. My die roll was completely anonymous – only I could know what I rolled
   a. 1 = strongly agree, 7 = strongly disagree
2. I played the die roll game with another participant
   a. 1 = strongly agree, 7 = strongly disagree
3. The throwing die was fair (completely random, like a real die)
   a. 1 = strongly agree, 7 = strongly disagree
4. The researchers checked whether I cheated during the die roll game
   a. 1 = strongly agree, 7 = strongly disagree
5. I cheated in the die rolling game
   a. 1 = strongly agree, 7 = strongly disagree