Investigating the Influence of a Time-based Incentive on Choice Blindness Detection Rates

Original Paper

Choice blindness is the striking failure to notice mismatches between intention and outcome in decision-making. This counterintuitive phenomenon has proven itself robust against a range of external influences and, despite numerous investigations, the underlying mechanism remains unknown. In the present study, we hypothesized that the occurrence of choice blindness would decrease if detection is facilitated through the provision of a time-based motivational incentive (i.e., "leaving early"). Participants (N=72) were randomly allocated to incentive or no-incentive conditions. All participants performed a computer-based general knowledge quiz with binary answer options, in which their answers were reversed for four questions. Detection rates were generally high and varied greatly between questions (range: 23-67%, M=44.7% concurrently; range: 32-88%, M=64.0% retrospectively). However, contrary to our expectations, the motivational incentive appeared not to affect detection rates. Possible interpretations, implications and limitations of our findings are discussed, including the possibility that high intrinsic motivation of our sample population overshadowed the incentive.

Keywords: choice blindness, decision-making, incentives

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INTRODUCTION

Human life is continuously shaped by countless decisions of varying impact, such as what to wear on a particular day, whether to date someone, or which career to follow. Choice blindness (CB) entails that the majority of people are often unaware of manipulations to the outcome of decisions they made, as long as these changes are made secretively (Johansson, Hall, Sikström, & Olsson, 2005). In a typical CB experiment, participants are presented with a binary decision task and are asked to choose which of the two options they prefer. Afterwards, they are presented with their choice and asked to rationalize the reasons for their decision. However, on a few critical trials, the participants are presented with the opposite of their original preference. The inability to detect the reversal of their choice is hence called 'choice blindness'. In the original demonstration of the phenomenon, in which participants were asked to choose the more attractive of two faces, only 20-40% of the manipulations were detected (Johansson et al., 2005). Thus the majority of participants were 'choice-blind'. Participants' insight into their decision-making process appears poor, as they often confabulate reasons for a decision they never made.

Even though the effect is counterintuitive, it has proven to be robust to replications across various modalities. CB has been shown for visual (Johansson et al., 2005), gustatory and olfactory (Hall, Johansson, Tärning, Sikström & Deutgen, 2010), auditory (Sauerland et al., 2013) and even haptic stimuli (Steenfeldt-Kristensen & Thornton, 2013). Furthermore, the CBparadigm has been extended to applied settings such as consumer behaviour (Hall et al., 2010), eyewitness decision making (Sagana, Sauerland, & Merckelbach, 2013, 2014b), opinion polling (Hall, Strandberg, Pärnamets, Lind, Tärning, & Johansson, 2013) and financial decision making (McLaughlin & Somerville, 2013). The full impact of the effect is perhaps best demonstrated by the fact that even moral principles (e.g., integrity vs. welfare or harm to the innocent) or beliefs about moral issues (e.g., government surveillance or prostitution) can be subject to CB manipulations. Hall, Johansson, & Strandberg (2012) used a trick of stage magic to reverse participants' initial rating on a range of moral issues and principles on a questionnaire on two out of seven items, with detection rates of only 44% and 50% respectively.

Despite some initial scepticism (e.g., Moore & Haggard, 2006), CB has been accepted as an important addition to decision making within cognitive psychology (Macknik, King, Randi, Robbins, Thompson & Martinez-Conde, 2008). Finding the underlying mechanisms or moderators of CB may allow to specify the situations in which CB diminishes. Making sound decisions is inherently associated with the outcome of those decisions, which is exactly what "blind" participants do not seem to notice. If people apparently do not seem to mind a reverse of their choices, they may have never been sure of them, or worse even, never have made these decisions consciously. Indeed, the notion that we are not consciously in charge of our decisions is a popular on in Psychology. (see Custers & Aarts, 2010 for a perspective). Thus, understanding the factors that moderate CB may lead to better decision making in practical settings for which CB has been shown to exist. For instance, opinion polling could be made more ecologically valid, and eyewitness statements more reliable. Furthermore, it may add a new perspective into moral decision making and could thus assist in discouraging moral inconsistencies.

So far, detection rates have been shown to increase with prolonged inspection time (Johansson et al., 2005) and greater dissimilarity between stimuli (Johansson, Hall & Sikström, 2008; Sagana, Sauerland & Merckelbach, 2013; Sauerland, Sagana, & Otgaar, 2013). A single mechanism that would significantly moderate CB however, has to our knowledge, not yet been discovered. For instance, Sagana, Sauerland & Merckelbach (2014a) ruled out memory distortions as a causal factor. Participants were asked to give sympathy ratings on a 10-point scale for female faces, which were occasionally manipulated by 3 points. Memory for the original rating was not significantly different across detected and non-detected manipulations, suggesting that suppression of the memory of the original choice through the manipulated rating is not sufficient to explain choice blindness phenomena. Further, in an effort to meet the criticism by Moore & Haggard (2006), that CB may be caused by a lack of relevance of the choice made, Sauerland, Sagana, Otgaar & Broers (2014) investigated the influence of self-relevance on CB in child and adolescent populations. To induce self-relevance, participants were either told that they may keep the stimulus (a toy; child sample) or that the stimulus would be implemented in their school (a chair; adolescent sample). No effect of self-relevance on CB for the adolescent sample was found, while the effects of the children sample were mixed. Hence, it was suggested that self-relevance may have a diminishing effect on CB only when self-relevance is high or personal. However, the self-relevance condition that had the greatest impact on CB was the prospect of keeping a toy in the child sample. Hence, it could be argued that in this case the effect of self-relevance was confounded by the incentive of this reward.

The influence of result-based motivational incentives has been extensively studied and it has been shown that they can enhance the ability to reorient attention and ignore taskirrelevant information (Veling & Aarts, 2010), improve working memory capacity (Beck, Locke, Savine, Jimura, & Braver, 2010) and have a positive impact on performance on cognitive tasks such as problem solving (Wieth & Burns, 2006). Striking effects of incentives have been documented among a vast number of domains. It has been well-established that drug addiction can at least temporarily be overcome with relatively small monetary incentives (Sindelar, 2008). Additionally, children who suffer from disorders of attention such as ADHD have been shown to perform indistinguishable from a control group on a behaviour-inhibition task when rewarded with a points system (Slusarek, Velling, Bunk & Eggers, 2001). Finally, Moore & Johnston (2013) established the effect of monetary incentives in an unfamiliar face matching task. Participants had to simultaneously inspect two unknown faces and decide if they were the equivalent. In the incentive condition, participants received monetary rewards for achieving a higher accuracy, which led to significantly better performance. Thematically, this is similar to the original CB study in using unfamiliar faces as stimuli (Johansson et al, 2005). Despite this promising theoretical background, an investigation into the effect of incentives on CB has, to our knowledge, not yet been published.

The present study aims to replicate the CB effect and to investigate the effect of motivational incentives on detection rates. Specifically, we reasoned that when an incentive was given for performing well, participants would more closely monitor the outcomes of their decisions, and would thus be more likely to detect mismatches with their intentions. Considering that this research was conducted as part of an undergraduate research practical, no funds for monetary incentives were available. However, inspired by non-monetary incentives such as the above mentioned points system, and considering that our participants would be students, who have to take part in multiple time-intensive research projects, we decided that "leaving early" could serve as a motivational incentive for this group of participants. It was reasoned that most students would be glad and try their best when given the opportunity to leave an experiment earlier than expected, and that this effect would be even stronger, when some aspects of the experiment were highly unpleasant by eliciting boredom. Therefore, half of our participants were informed that, depending on their performance, they would be able to leave the lab much earlier while the other half (i.e., the control group) received no such instruction. Boredom was induced by a filler task between blocks of questions that was allegedly going to reappear if participants performed poorly.

We hypothesised that a time-based incentive would moderate CB in our sample population. It was expected that participants who had been instructed that they could leave the lab earlier would be more likely to detect a reversal of their choice compared with participants who received no such instructions. Additionally, feedback on the manipulated questions could be either negatively framed ("That was wrong!") or, positively framed ("That was "correct!"). Because a supposedly wrong answer would be associated with a lowering of the accuracy rate, and thus interfere with the participants' objective, it seems plausible that a manipulation framed in this way would be detected more often. Thus, our secondary hypothesis was that detection rates would be higher for those manipulated questions for which feedback was always negatively framed, as compared to positively framed ones.

METHODS

Participants

In total, 72 (51 female, Mage = 20.8, SDage = 1.4, range: 19-24) second year psychology students from Maastricht University participated in our study. All participants were taking part in a second year research practical course and were rewarded with course credit for their participation. Participation was voluntary and each participant was tested individually. Participants that had previously taken part in similar (i.e. CB) studies were excluded, as the CB effect would diminish. Six participants (5 experimental, 1 control) had to be excluded from the analysis because they either misunderstood instructions, took defiantly long time to complete the task, or their data files were lost. Thus, the analysis included N = 66 participants (47 female, Mage = 20.8, SDage = 1.4, range: 19-24). Of these, 31 (23 female) were assigned to the experimental and 35 (24 female) to the control condition. The study was approved by the standing ethical committee of the Faculty of Psychology and Neuroscience at Maastricht University..

Materials

General knowledge quiz

To provide a basis for choice blindness manipulations we implemented a general knowledge quiz. The quiz consisted of a total of 60 questions and each question had two answer options. We deliberately chose questions that were thematically familiar to our participants, yet to which they would be highly unlikely to know the right answer (e.g. "For which country was the statue of Liberty originally intended? Egypt or Algeria?"; "Birds cannot pee. True or false?"). To ensure this, we conducted a pilot study where students (N = 41, 26 female, Mage = 23.1) were asked to answer a larger list of questions to their best knowledge and guess wherever appropriate. Of this larger list, we systematically selected only those questions that were answered correctly on about 40-60% of trials. Questions could be true/false, yes/no or with two given answer options. The main experiment was compuer-based and implemented in 'Open Sesame' (Mathôt, Schreij & Theeuwes, 2012).

Conjunctive Continuous Performance Task (CCPT)

This task (Shalev, Ben-Simon, Mevorach, Cohen, & Tsal, 2011) was implemented as a filler task. Sustained attention tasks have been empirically established to elicit boredom in participants (Malkovsky, Merrifield, Goldberg & Danckert, 2012). We reasoned that the desire to escape having to do this comparatively unpleasant task for a second time would further strengthen our incentive to perform well in the subsequent set of questions. Specifically, in this task participants where presented with short presentations of various simple visual stimuli and had to press the space bar every time a red square appeared.

Post-experiment questionnaire

A questionnaire considering whether participants noticed any of the manipulations during the experiment but refrained from revealing them. The questionnaire contained a brief description of all 20 questions used in the third part of the experiment. Participants could tick the questions they were certain to have been manipulated and additionally the questions they thought felt odd, thus encouraging reporting of detections. In the analysis, both ratings of certainty and oddness were counted as detections when the selected question was manipulated, or as false positive when it was not. Unlike the main experiment, the questionnaire was administered on paper.

Design

This study employed a 2 (condition: incentive vs. no incentive, between subject factor) x 2 (feedback: negatively framed vs. positively framed, within-subjects factor) mixed design. Participants were randomly divided into conditions. The detection rate of the manipulated questions was the dependent variable. Two different measures of detection rate were used, namely concurrent and retrospective detection. Concurrent detection included the instances of detection that took take place immediately after the presentation of the manipulated outcome as indicated in the written comments of the participants when asked to justify their choices. In line with approaches used in previous CB experiments (Johansson et al., 2005), retrospective detection was handled as an upper bound of possible detection rates, and thus included all concurrent detection and additionally instances of detection as indicated on the post-experimental questionnaire.

Procedure

The day before arriving at the lab, participants received an email with instructions for the study depending on the condition they were assigned to. The experimental group received an email in which it was stated that, depending on their performance (meeting an accuracy of 70%), they could leave the lab 20 minutes earlier or later. Participants in the control group were solely informed that the duration of the study was approximately 50 minutes (i.e., the true duration of the study).

Upon arriving at the lab, participants were told that we were interested in investigating the effect of cues and heuristics on decision making. This cover story was necessary as the effect of choice blindness would diminish if participants knew about the real purpose of the study. After signing the informed consent form, they were informed about the procedure of the study. Specifically, they were instructed that they will be confronted with a series of factual questions and that each question has two possible answers. To select an answer options they could press the 'z' and 'm' keys on a keyboard. They were also told that the questions may be specific and difficult, but that they should stay confident throughout the test. Additionally, participants in the incentive condition were reminded that in order to leave the lab earlier, a performance of at least 70% accuracy was required. If the accuracy rate was below the 70%, they would have to do a filler task after every set of questions, followed by another set of questions. However, the true duration of the test did not depend on the actual performance. This deception was necessary to make the incentive believable.

Beginning with the test, the program started with the first series of 40 questions. The order of all questions was random within sub-blocks of 10 questions. After every question, participants saw a masking stimulus for 2000ms and after the mask they were presented with their choice and were informed whether their answer was 'correct' or 'wrong'. Additionally, for 8 of these 40 questions, participants were asked to explain the reason for their choice by typing a short statement immediately after the answer was given. Furthermore, after every sub-block of 10 questions, participants were wrongfully and consistently informed that their performance was below 70%. This information was only relevant to the experimental group as the control group was told to ignore their performance rate.

Upon completion of the first series of questions, participants were instructed by the program to contact the experimenter. The experimenter then either informed participants that due to their insufficient performance they would now have to do a filler task (experimental) or that they could simply proceed with the next task (control). Subsequently, participants in both conditions were required to do the CCPT filler task for about 10 minutes.

After completing the CCPT filler task, participants had to complete a second series of 20 questions. The procedure was analogous to the first series of questions except for one crucial detail: we manipulated the outcome of 4 of the 8 questions for which participants had to justify their answers (see Table 1 for the manipulated questions). The manipulation was such that participants were presented with the opposite of their original decision. Furthermore, for these four manipulated questions, the feedback participants received was fixed to be either positive ("That was correct!") or negative ("That was wrong!"), regardless of the actual answer given. Note that, although the order of questions was random, two of the manipulated questions (one 'wrong', one 'correct') always appeared in the first sub-block of 10 questions, and the other two in the second sub-block of 10 questions (one 'wrong', one 'correct').

After finishing the second series of questions, the experimenter entered the room and informed the participant some questions may have been manipulated, but did not offer any clues whether or for which questions this could have been the case. The participant was then asked to indicate whether she noticed any such manipulation by filling in the post-experimental questionnaire. Thereafter, participants were debriefed, and received their course participation credit. As part of the debriefing, participants were asked not to share any information regarding the experiment, this was also marked on the debriefing sheet which they received.

Analysis

Data was analysed using MS Excel 2010 and statistical tests were performed in IBM SPSS version 21. Statistical analysis was conducted employing a significance level of .05. Concurrent detection rates were scored by rating the justifications that participants gave after a manipulated choice as detection or non-detection. This was done by two experimenters, who were blind to the subject's condition. Conflicts were resolved through discussion. Detection rates from the questionnaire were scored as detections whenever participants noticed the question to be certainly manipulated, or felt them to be odd. Previous studies of CB have been mostly limited to exploring the strength of the phenomenon through descriptive statistics. In this instance, a between subjects design was used with the intention to generalise group effects. Thus, inferential statistical tests for binary variables were conducted.

RESULTS

Independent of the condition, the average concurrent detection rate was 44.7% (*N*=66). Including retrospective detection in the post-experimental questionnaire, 64.0% (*N*=66) of manipulations were detected. Hence, a total CB rate of 36.0% (*N*=66) was found.

Table 1. *The four manipulated questions and their respective detection rates. While the order within a block of 10 questions was randomised, questions appeared only in that block.*

Original question	Feedback (regardless of answer)	Block of Appearance	Concurrent detection	Retrospective detection
1. When did Rudolf Diesel introduce the first engine named after him? 1897 or 1886	That was correct!	Block 1	23%	32%
2. Where does the Bagel come from? Europe or America	That was wrong!	Block 1	67%	79%
3. What TV show is more successful? Big Bang Theory or Friends	That was correct!	Block 2	53%	88%
4. Pepsi light is more often sold than Cola Zero.	That was wrong!	Block 2	36%	58%

Effect of Incentive

Firstly, we compared detection rates for questions that always appeared among the first 10 questions (1. & 2. in Table 1) with those that always appeared among the last 10 questions (3. & 4. in Table 1) to test for a possible order effect. 30.3% of participants did not detect any manipulation in the first block of questions, compared with a slightly higher non-detection rate of 33.3% in the second block of questions. A related-samples Sign Test was not significant (Z=0, p=1, r=0).To test whether the incentive time moderated CB detection rates, two Mann-Withney U Tests were performed, one for concurrent and one for retrospective detection. The two conditions did not differ with regard to either concurrent (U(1, 66)=501.5, Z =-.54, p =.59, r=.07) or retrospective detection rates (U(1, 66)=466, Z =-1.04, p=.30, r =-.13). On average, the amount of concurrently detected manipulations was M=1.71 in the experimental and M=1.86 in the control condition. Similarly, for retrospective detection the amount of detected manipulations was M=2.45 in the experimental condition and M=2.66 in the control condition. These results do not support the idea time-based incentives can moderate CB (Figure 1). As participants had the possibility to both concurrently and retrospectively (via the post-experimental questionnaire) wrongly detect manipulations on in fact non-manipulated questions, there was potential for false positive detections. A Mann-Withney U Test between the incentive conditions and the false positive detection rate was performed. As there were no concurrent false positive detections, only retrospective detections were analysed. However, no significant differences between the conditions were found (U (1, 66)=524.50, Z =-.25, p =.80, r =.03).

Effect of Feedback

Regardless of condition, all participants received positive or negative feedback on the manipulated questions, indifferent of their actual answer. To test the hypothesis that negatively framed feedback would lead to a higher detection rate, a related-samples Sign Test was performed. The findings confirmed our hypothesis for concurrent detection only (z (1, 66)=-2.11, p =.03, r =.26). Participants detected the manipulation more often for negatively framed feedback questions (M=1.03) than for positively framed feedback questions (M=.76). However, this effect diminished retrospectively with M=1.2 for positive and M=1.36 for negative feedback, respectively (Z=-1.74, p =.08, r=-.21). Thus, the secondary hypothesis can only be supported for concurrent detection (Figure 2).

Finally, hoping to gain insight into lack of difference between our conditions, the four manipulated questions were considered separately. In doing so, considerable differences in concurrent as well as retrospective detection rates across the questions were observed (Table 1.). This indicates that CB was moderated by differences between the question types.

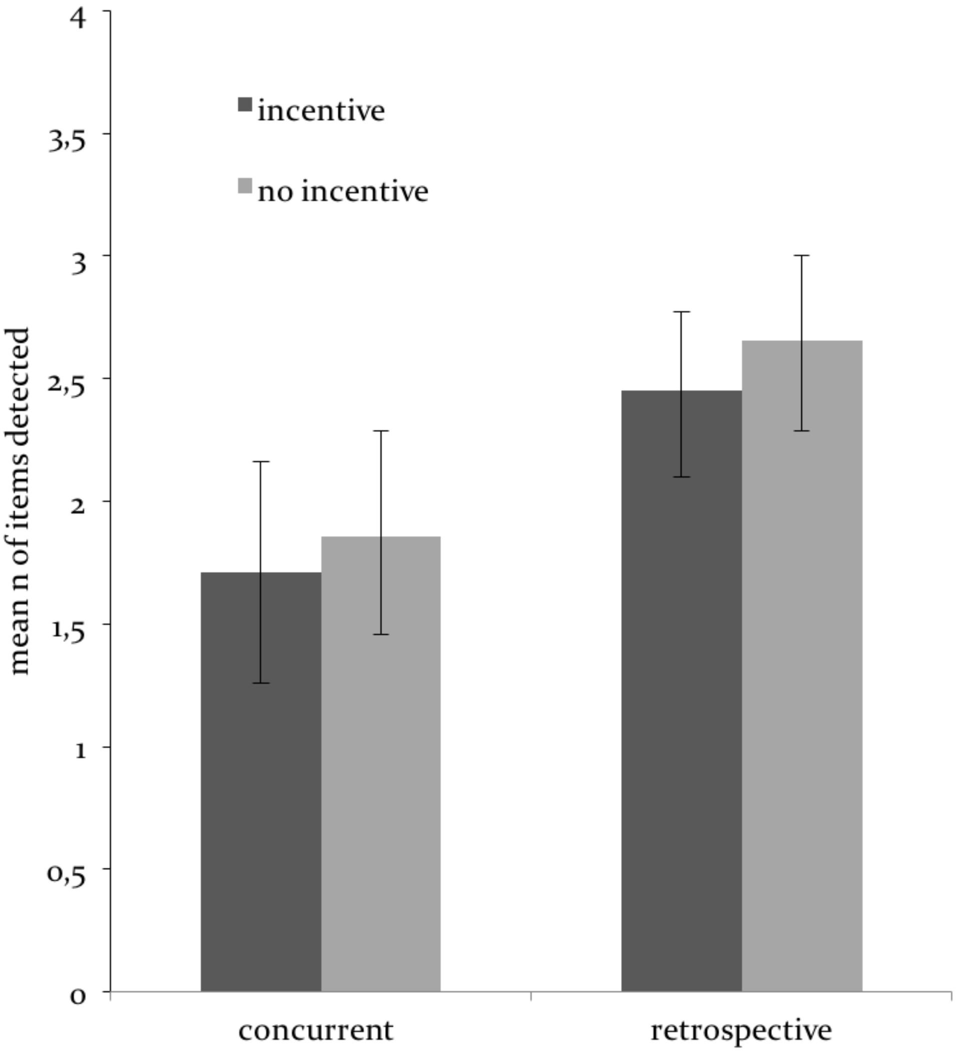

Figure 1. *Mean concurrent and retrospective detection rates (+/- SEM) by condition. Participants in the incentive condition where repeatedly told they could leave much earlier, when performing well, while those in the no incentive condition were told that the experiment lasted 50 minutes. The prospect of leaving early was strengthened by making parts of the experiment deliberately boring*

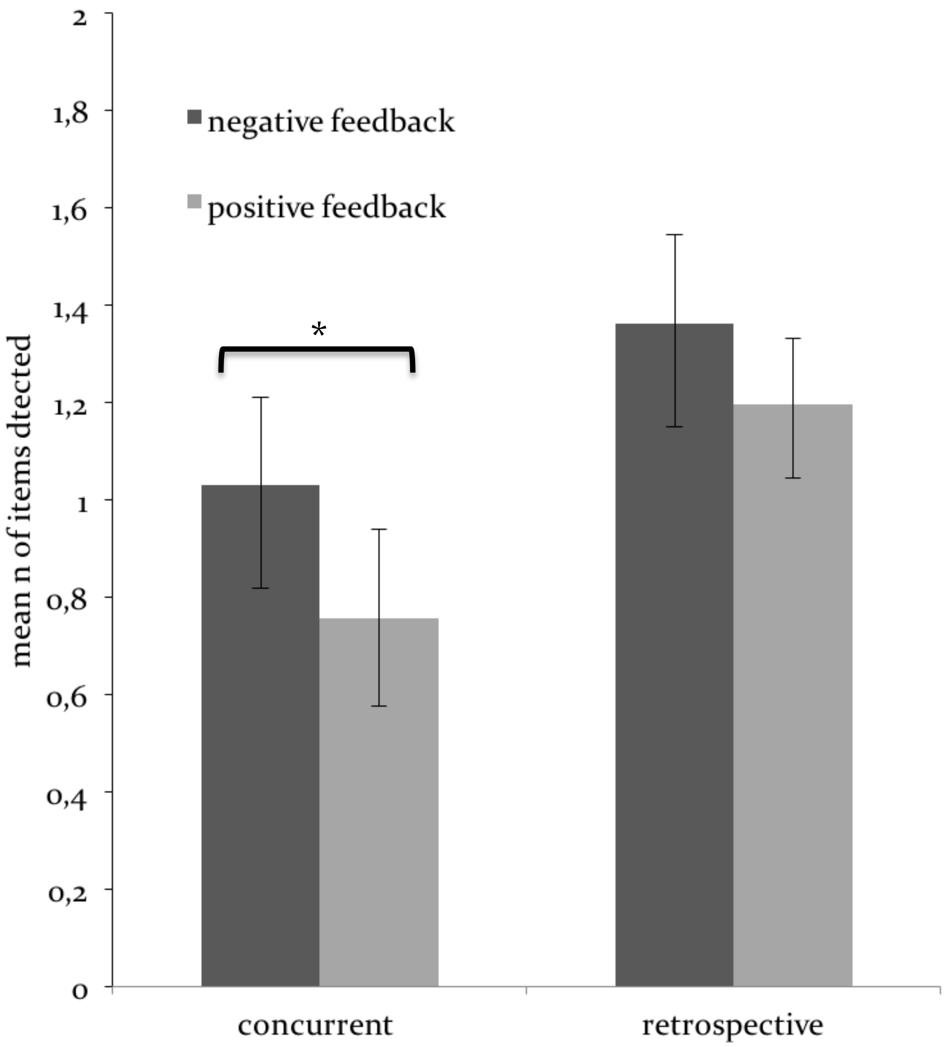

Figure 2. *Mean concurrent and retrospective detection rates (+/- SEM) by feedback framing. Feedback could be either positive ("That is correct!") or negative ("That is wrong!"). This is important in so far, as "wrong" answers seemingly lowered participants accuracy rates, and thus diminished the opportunity to leave early for participants in the incentive condition. In contrast a "correct" manipulated question seemingly gave participants credit towards this incentive.*

DISCUSSION

The purpose of the present study was to investigate the impact of motivational incentives on detection rates in CB manipulations, which we operationalized as a time-based incentive ("leaving early") in a a student sample.

First, the hypothesis that time-based incentives would moderate CB and increase detection rates of manipulations, could not be supported in our sample population (Figure 1). Furthermore, we expected that detection rates would be higher for manipulated questions with negatively framed feedback ("That was wrong!") than for positively framed feedback ("That was correct!"). The findings support this hypothesis with regard to concurrent detections only, as the effect diminished retrospectively. Additionally, no order effect was found. Further analysis revealed unexpected and large differences in detection rates between the four manipulated questions concurrently as well as retrospectively.

Due to the fact that a novel paradigm was used in this experiment for eliciting the motivational incentive to perform well, and no effect was found, no preliminary evidence concerning the broad influence of motivational incentives on detection rates can be supported by the evidence. Anecdotal evidence supports the interpretation that many participants in the experimental group thought that they had performed poorly and that this would have been the reason for the unexpectedly long duration of their participation; a formal manipulation check was not included however, as we reasoned that a question "did you believe the incentive was real" would have been too suggestive to ask. Thus, we argue that the time-based incentive used in this study likely worked to some degree, although this cannot be proven.

Another possible explanation for this non-significant result might be that participants both in the control and the experimental condition got frustrated due to the boring filler task and their insufficient accuracy rate they received as feedback. This may resulted in an increase in intrinsic motivation to perform well in the quiz, meaning that both groups had the same motivation while performing the task. As a result, our extrinsic incentive for the experimental group to leave the lab earlier was overruled by a stronger intrinsic motivation to perform well that equally affected both groups, thus accounting for generally rather high rates of detection. Intrinsic motivation is in general defined as "doing something for its own sake," while extrinsic motivation refers to the performance to achieve a desired outcome (Ryan & Deci, 2000). According to Deci and Ryan's (1985) self-determination theory, extrinsic incentives undermine intrinsic interest. Thus, a detrimental effect of the incentive would have been expected. Hence, it is more likely that extrinsic motivation (i.e. incentives) does not moderate CB, while intrinsic motivation in fact does. This could explain the relatively high detection rates, as our consistent impression that participants were enthusiastic about the experiment and tried to do well in their own interest. Additionally, the elicited intrinsic motivation may have been further facilitated by our cover story ("Do you think you know everything") which implied that participants in our study have to undergo a knowledge quiz. This might have challenged participants additionally to perform as well as they can at the task regardless of how time consuming that would be. In future research it might be better not to present the control group with the accuracy rate to rule this possible confounder out, and better control for how the study is advertised.

Regarding Sauerland and colleagues (2014), it appears likely that a high or personal degrees of self-relevance can noticeably diminish CB rates. Such an interpretation is intuitively plausible. After all, it would be hard to imagine that a convinced iphone-user would buy the newest Samsung device purely by accident. Further, as it has been considered in the original demonstration of the phenomenon (Johansson et al., 2005), people simply do not expect such manipulations as there is no experimenter that swaps the outcome of their decisions in everyday life. Our vulnerability to CB may thus be comparable to other effects that give insights into the inherent limitations of human cognition. Especially the literature on decision making is rich with such phenomena as it has been well-established that decisions can be predictably irrational (Kahneman & Tversky, 1979) and influenced by seemingly meaningless information through framing effects (Tversky & Kahneman, 1981). Moreover, it has been suggested that the idea of stable underlying preferences may be an illusion, because preferences are made up on the spot (Ariely, Loewenstein & Preclec, 2003; Ariely & Norton, 2008). This is suggested to be the result of stable underlying anchor effects that empirically have been proven to elicit stable demand curves similar to the curves presumably resulting from underlying preference.

It has also been hypothesized that detection rates would be higher for manipulated questions for which feedback was always negatively framed ("That is wrong!") than for positively framed ones ("That is correct!"). This effect was shown to be significant only for concurrent detection rates and diminished when including retrospective detection (Figure 2). An explanation could be that, as expected, participants did not object to positively-framed feedback because they wanted to leave the lab early. But when the feedback was negative-framed, it meant that they had to stay longer and therefore they reacted. Another reason for this effect could be that participants in both groups felt the urge to perform well during the task. When the manipulated feedback was positive they potentially simply felt pleased that it was correct. They possibly even did notice the change, but they did not make note of it during the justification. However, regarding the manipulated questions with the negative feedback, participants may have written a justification when the manipulation was noticed, because their actual performance was better. Therefore, the objective to leave earlier was hindered. In conclusion, participants presented with negatively framed feedback may be more likely to check their performance once again to get insight in their failure.

Turning to the difference in detection rates across the four manipulations, the highest retrospective (88%) and a high concurrent (53%) detection rate were observed for the question regarding the most successful TV show (see Table 1). Almost all participants noticed that they were presented with the opposite of their choice in the end. A plausible explanation could be the high self-relevance that answer to this question has for participants. Watching TV is popular in the age group of our participants so it would be reasonable that the participants knew both TV shows and were interested in the correct answer. However, this explanation assumes a high or personal interest of participants, according to Sauerland et al. (2014). The question concerning the bagel had also a high overall detection rate (67% concurrent, 79% retrospective; see Table 1). Again, students might have been highly interested to find out where it does indeed come from, or suspected a particular answer. Moreover, they received negatively framed feedback to the question, which had a significant effect on concurrent detections. The other two manipulated questions were different in nature. While the question about the first Diesel motor asked to indicate a year (1897 vs. 1886), the question about Coca Cola and Pepsi concerned if the statement is true or false (see Table 1). Alternatively, one could argue that some questions may have been suggestive, for instance because "Friends" is no longer aired, while the "Big Bang Theory" still is. We would at this point, however, like to stress that all questions were selected after conducting a pilot study, and that said pilot, participants were unable to know the correct answer to the selected questions.

While it is still plausible that motivational incentives do not have any influence on CB detection rates, the effect has to be investigated in more detail. For instance, Veling & Aarts (2010), who investigated monetary incentives in a Stroop paradigm, found significant effects only for relatively high monetary rewards. In the present task, the time-based incentive likely was too weak to have a measurable effect. Thus, further investigations into different levels and kinds of motivational incentives will be necessary to gain definite insight in their influence on CB manipulations.

In conclusion, further research on CB could lead to more insight into this phenomenon. People seem to be unaware of manipulations to the decisions they made most of the time. Efforts to lower CB rates have not been successful and the underlying mechanism of CB is still unknown. This work extends the existing literature on CB insofar as, for the first time, an effect of motivational incentives on detection rates was investigated. Future research should address the effect of stronger, and more established, incentives such as large monetary rewards. The fact that detection rates vary starkly between specific questions gives hope that a mechanism can be found, as does the possibility that intrinsic, not extrinsic motivation moderates CB. Practical implications could touch upon the reduction of blindness rate in the context of eyewitness identifications, polling and moral decision making. This could be a relevant branch of research considering that eyewitness statements can have profound effects on sentencing in the justice system, while opinion polls are directly related to a number of relevant research applications and politics. Thus, it remains relevant to continue the investigation of mechanisms that could moderate or diminish the occurrence of CB.

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AUTHOR CONTRIBUTION

All authors designed & conducted the study, MK & CK analysed the data, MK, CK & RM wrote the manuscript.