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Gender Differences in the Effect of Impatience on Men and Women's Timing Decisions

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Abstract

Decisions over the timing of actions are critical in several safety, security and healthcare scenarios. These decisions, similar to discrete decisions, can be influenced by biases and individual traits. In this paper, a bias of impatience is studied in an experiment with 626 participants, with a focus on gender differences. Impatience was moderated with a manipulation of a variable-speed countdown. Men and women differed in how they expressed impatience. While men systematically and irrationally act earlier when become impatient following the slower countdowns, women react by irrationally requesting earlier information about the outcome of each trial, and impulsively pressing an inactive key.

Keywords: Impatience; gender differences; decision-making; timing decisions; women; men

Introduction

When people make decisions, their choices are gravely affected by systematic biases and individual preferences. This set of well-known phenomena has been extensively studied for the case of choices between discrete alternatives (e.g., Tversky & Kahneman, 1974; Gigerenzer, 1996; Wittmann & Paulus, 2008 ;Croskerry, 2002). However, we know much less about the case of decisions over a time continuum, that is, *when* rather than *how* to act. Timing decisions, which are decisions about *when* to take an action, as opposed to *what* to do, are critical in several security, safety, and healthcare scenarios, where acting early and late can both lead to dramatic losses (e.g. when to undergo medical screening, when to change car tires, or when to check smoke detectors in a big company).

In this paper, we study a bias we found on timing decisions: impatience. We specifically examine the hypothesis that men and women react differently to induced impatience. Understanding gender differences, we believe, is essential to accurately modeling the effects of biases and individual differences in timing decision-making.

The existence of gender differences in timing decisions is to be expected, if discrete decision-making serves as a comparison. Risk-taking behavior of men and women has been investigated especially in the context of financial decision making. Powell and Ansic (1997) proposed that women are generally less risk-seeking compared to men, regardless of the costs, ambiguity of the situation, task familiarity, and framing. They also showed that men and women use different strategies in financial decisions, even if this difference did not reliably affect the final outcome.

The relative risk propensity of men and women is strongly affected by framing. For the general case, the classical result is that risk-taking increases in the face of gains compared to potential losses (Daniel Kahneman, 1979). This is true more so for men than for women in surveys and in abstract gambles (Schubert, Brown, Gysler, & Brachinger, 1999): here, women are comparatively more risk-taking towards losses. An explanation for the differences, if they exist, may be that women are more sensitive to punishment (Cross, Copping, & Campbell, 2011). However, Schubert et al. (1999) specifically showed that in financial decisions, the relative risk propensity of men and women is strongly affected by the decision frame. For practical contexts, however, men and women were not reliably different in terms of their propensity to take risks with gains vs. losses. Thus, gender differences are not uncontroversial in discrete decision-making, and warrant careful analysis in other types of decisions, too.

Gender differences do affect how individuals value future rewards in relation to the time gap between the discrete decision made now and the reward obtained later. Dittrich and Leipold (2014) asked participants to choose between two options: receiving \$100 in one month, or receiving \$100+N in 13 months. Women accept delayed gratification considerably more than men. Based on these results, they concluded that women tend to be more patient compared to men (Dittrich & Leipold, 2014). We consider this to be a result of differences in temporal discount rate. Although impatience can be a factor affecting temporal discounting, we believe that it has a broader definition, which is different from the discount rate. We hypothesize that it can be reflected differently by individuals, and by people of different genders. For lack of a better operationalization, we refer to The Oxford English Dictionary, which defines impatience as "the feeling of being annoyed or irritated by somebody/something, especially because you have to wait for a long time", and "the desire to do something soon or for something to happen soon". This latter definition is the operational one for the present study, and we refer to the earlier definition by checking participants' overall satisfaction in our experiments. We investigate gender differences in the reactions to an impatience-inducing manipulation, which may prompt individuals to act earlier than they would otherwise, or to make costly choices that allow them to obtain information earlier than they would otherwise. These biases apply even when associated with a lower expected reward.

We will present two experiments, in which people decide on timing of actions. In experiment 1, we moderate impatience and study the effect on different genders. In experiment 2, which involves a more straightforward task, we further study differences in how men and women reflect impatience.

Experiment 1

We use experimental games to study participants' choice of timing in situations that are similar to real-world. In the first experiment, we use a game, which is inspired by the *FlipIt* game of "stealth takeover" (Van Dijk, Juels, Oprea, & Rivest, 2013). In our game, participants are required to find a strategy to search for an unknown action made by an opponent. Each round lasts 30 seconds. Each attempt to catch the opponent, and each second of latency in catching her/him have costs. In each round of the game, participants first decide on the timings of checking on the opponent. After setting the timings of checks, participants choose between the two possible ways to start the game: the first choice is to start the game normally. By choosing it, participants get visual updates on whether the opponent has played or not when they reach one of their checks. That is to say, if a participant sets two checks at t_1 and t_2, and the opponent plays at t_O ($t_1 < t_O < t_2$), and he/she starts the game normally, then at t_1 he/she will realize that the opponent has not played yet, and at t_2 he/she will be updated that the opponent has played at t_O and he/she has caught it at t_2 (see Figure 1). The second option is to start it *live*. The live option, which costs the equivalent of two additional checks (200 points), lets participants see when the opponent plays instantly. That is to say, in the aforementioned example, participants see the opponent's action as soon as it plays at t_O, however, they still need to wait until t_2 to be able to catch it (see Figure 1). We hypothesize that impatience can lead to a tendency to receive information faster, and we use the *live* option to study our hypothesis. We consider the live option as an irrational way of starting the game, since participants need to pay to choose it. However, this choice would have no benefits for them: it neither affects the duration of the game, nor their outcome, since even though they see the opponent's action, they would still need to wait for their next check to catch it.

The experiment has four conditions. In all the conditions except for the control condition, we introduce a 15-second countdown (and a sensible explanation "Saving Checks") between choosing to start the round and actually watching the round. We hypothesize that waiting before watching the round increase participants' impatience. We also hypothesize that it is possible to moderate impatience by showing different speeds of countdown, and test it in different conditions of the experiment. Thus, the conditions of the experiment are as follows:

- **NoWait (control)**: Participants experience no waiting and the game starts right away.

- **5CD**: Participants experience a 15-second wait between starting and watching the game, which is accompanied by countdowns from **5 to 1** (each count lasts 3 seconds).

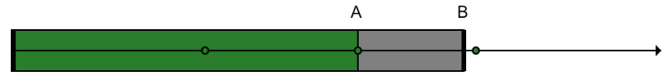

Figure 1: Feedback during a round, which is started normally. The game is current and at point B. Since the latest check time of the participant is set to be at point A, no information after point A is revealed. The dots on the bar represent check times that are set by the participant.

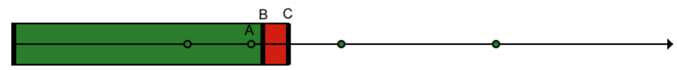

Figure 2: Feedback during a round, which is started live. The game is current and at point C. The latest check time of the participant is set to be at point A, and we can see that the opponent has played at point B. However, the participant needs to wait until the next set check (shown with dots on the game bar) to catch the opponent.

- **10CD**: Participants experience a 15-second wait between starting and watching the game, which is accompanied by countdowns from **10 to 1** (each count lasts 1.5 seconds).

- **15CD**: Participants experience a 15-second wait between starting and watching the game, which is accompanied by countdowns from **15 to 1** (each count lasts 1 second).

After participants are randomly assigned to the experimental conditions, they first complete a survey with four demographic questions, three basic integrity questions, seven risk propensity assessing questions (Meertens & Lion, 2008), and five need for cognition (NFC) assessing questions (Wood & Swait, 2002). Afterwards, they see the game instructions and start the game.

Since we want to make sure that the participants are paying attention to the game, we prevent them from switching to other windows on the screen, and monitor their attention by asking to press a specific key immediately after the unpredictable end of the game.

Cover Story

We add a cover story to the game and call it the *Cookie Monster Game* to make it easier to understand for the participants on Amazon Mechanical Turk. Participants are told that they have invited the Cookie Monster (the opponent) over for dinner. While they are cooking for their guest in the kitchen, the Cookie Monster is waiting in the living room with a big box of cookies. Participants are told that the Cookie Monster will definitely start eating the cookies, and with a constant pace, but no one knows when. They need to find a strategy (set different alarm times) to check on him. Whenever they catch the Cookie Monster, the game ends. However, if they check on the Cookie Monster before he has started eating the cookies, they need to give him some cookies to apologize for not

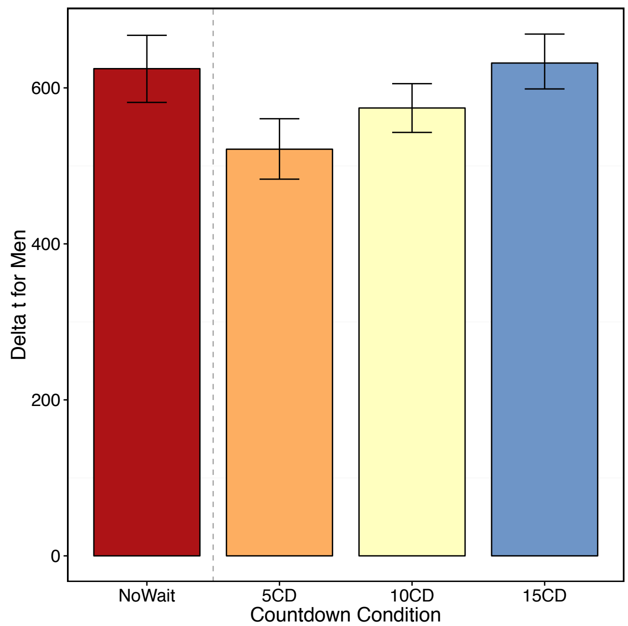

Figure 3: Average time between check times for men in each condition. Lower values reflect earlier (more frequent) checks. Men who see the slower countdown check more frequently.

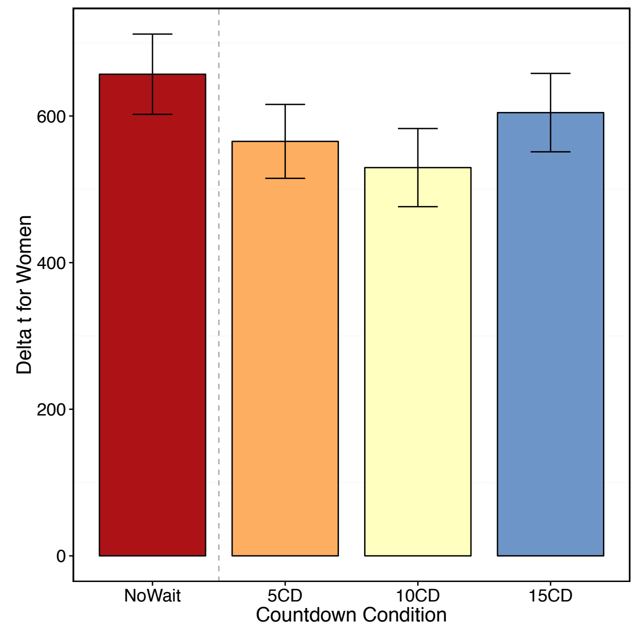

Figure 4: Average time between check times for women in each condition. Lower values reflect earlier (more frequent) checks. Speed of countdown does not significantly affect the frequency of women's checks

trusting him. The number of remaining cookies will translate to the bonus money that they will receive at the end of the experiment.

Method

503 volunteers (211 female and 292 male, age mean 33.9y, range: 18-77) on Amazon Mechanical Turk participated and passed the attention tests. Each participant played 6 rounds of the game. The results of the first round is not included in the analysis: it was labeled "practice round", and the participants first experienced countdowns and learned about the live option in this round.

Results

We calculate an average time difference between the checks, per participant, and per round. We call it Δt. Δt represents the average time that participants decide to wait between their checks, which reflects how frequently they check. We believe that a change of Δt in different conditions can reflect a change in the level of participants' impatience. Δt is calculated for all participants in all experimental conditions, and based on genders. The results for men and women are visualized in Figures 3 and 4.

In a linear mixed-effect model (see Table 1), we investigate the effect of our manipulation on participants' Δt, which we interpret as impatience. The model predicts men's and women's Δt based on round number, need for cognition, and the duration of each count in the countdown (1 for 15CD, 1.5 for 10CD, and 3 for 5CD). Round number reflects participants' proficiency in the game. NFC, which is the tendency to engage in thinking (Olson, Camp, & Fuller, 1984) reflects how much individuals enjoy and are desired to think. We use it in our model as we hypothesize that NFC affects participants' strategy. A random intercept varying by subject is fitted to account for the individual differences.

Table 1: Regression model predicting Δt for different genders. Count duration and round num are centered. The model was not sensitive to age as a predictor.

Covariate	Estimate	SE	t	Pr $(> \|t\|)$
genderF	5.810	0.361	16.114	< 0.0001
genderM	6.257	0.293	21.379	< 0.0001
round num	0.242	0.102	2.368	< 0.05
need for cognition	0.016	0.020	0.767	0.444
genderF:count duration	-0.271	0.538	-0.504	0.615
genderM: count duration	-1.011	0.488	-2.071	$< .05$

Men's Δt is significantly affected by the speed of countdown ($se = 0.488$, $t = -2.071$, $p < .05$). Men seeing the faster countdowns play less frequently than the ones seeing the slower countdowns. Women's Δt, however, is not affected by the countdown manipulation ($se = 0.538$, $t = -0.504$, $p = 0.615$).

In another model we investigate the effect of our manipulation on the choice of live. The model uses NFC, count duration, and round number to predict choice of live. A random intercept varying by subject is fitted to account for the

Table 2: Regression model predicting choice of live. Count duration and round num are centered.

Covariate	Estimate	SE	t	Pr (> |t|)
genderF	1.135	0.059	19.149	< .0001
genderM	1.133	0.060	19.020	< .001
NFC	-0.0002	0.002	-0.122	0.903
genderF:count duration	0.112	0.048	2.319	< .05
genderM:count duration	0.002	0.044	0.040	0.968

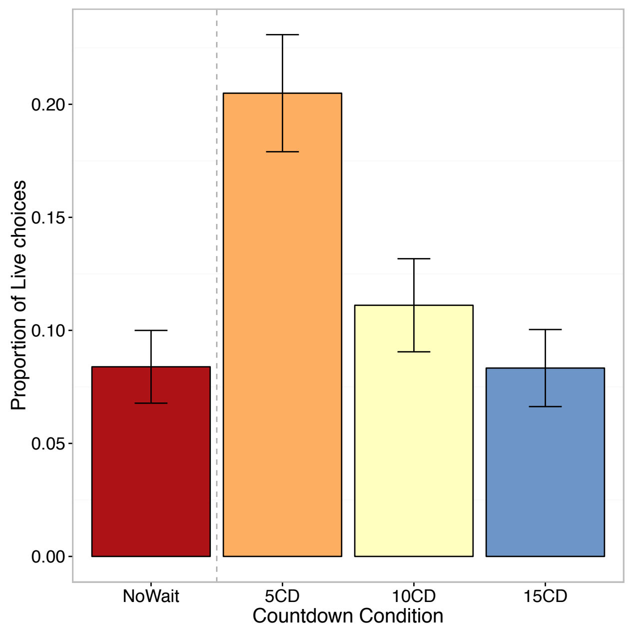

Figure 5: Proportion of live choices for women in each condition

individual differences (see Table 2). Women's choice of live is reliably affected by the speed of countdown ($se = .048$, $t = 2.319$, $p < .05$). Women seeing the slower countdown pay to choose *live* reliably more (see Figure 5). Men's choice of *live*, however, is not affected by the speed of count down ($se = .044$,$t = .040$, $p = .968$).

We report no correlation between Δt and the measured risk propensity.

Overal satisfaction: At the end of the game, participants had a chance to leave us comments. Since it was not mandatory, many participants left without leaving any comments [1]. Positive comments were predicted based on NFC and count duration (see Table 3). The number of men's positive comments is significantly affected by the speed of countdown. Men seeing faster counts leave reliably more positive comments ($se = 0.439$, $z = -2.496$, $p = 0.013$). However, the

[1]Some examples of the positive comments are: "Great taks", "Thanks. It was very fun & unique.", "Wow!!! I loved this game. Please send me another one like this in the future. Thanks". Negative comments pertained to technical issues; they were very low in number.

Table 3: Predicting positive comments based on the game condition.

Covariate	Estimate	SE	z	Pr (> |z|)
genderF	-1.461	0.312	-4.683	< .0001
genderM	-1.039	0.235	-4.428	< .0001
need for cognition	0.054	0.019	2.793	< .01
genderF:log(countDuration)	0.027	0.458	0.059	0.953
genderM:log(countDuration)	-1.096	0.439	-2.496	0.013

number of women's positive comments is not affected by the speed of countdown ($se = 0.458$, $z = 0.059$, $p = 0.953$).

Experiment 2

In order to test more explicitly for impatience, we consider data from a simpler game. In this section, we provide analysis of data reported previously (Ghafurian & Reitter, 2014, Exp.2). 123 participants recruited on MTurk took part for compensation that included an incentive-compatible bonus. The game is similar, but much less complicated than the game in Experiment 1. In this game, the opponent played exactly once during the game, and the participants were asked to either check (play) before the opponents move (early condition), or after it (late condition). Participants were given only one chance to check, and based on the experimental condition, the best strategy was to either play early (at the beginning of the game), or late (at the very end). This experiment allows us to study impatience in a situation where decision-making is dynamic and the rational choice is clear, as opposed to the first experiment, where *checks* were pre-defined and the rational choice was not clear.

Participants in both early and late conditions were also assigned to either of two different trial durations (5 and 15 seconds). To make sure that participants are not motivated to play early (to finish the experiment faster), the game did not end after they made their single check, and continued for the full period of the round. In Ghafurian and Reitter (2014), we discussed how impatience affected the participants' actions. Participants performed reliably better in the early condition, and showed a consistent preference to play early.

With a view of gender differences, we measured the check times as well as how many times participants pressed *check* impulsively, despite the fact that they only had one chance (this was made clear to them). A check was considered *impulsive* when the space key was pressed repeatedly, even though though the button was deactivated and hidden after the first time. The number of times the space bar was pressed (or the area on the screen was clicked) was counted.

We will analyze the timing of each check, as well as the number of impulsive attempts for checking.

Cover Story

To make it easier to understand for the participants on Amazon Mechanical Turk, we add the *Cookie Monster Game* cover story to this experiment as well. However, in this game, the story is different. The abstract version of the cover story for early and late conditions are as follows:

Late condition: *Imagine you are the Cookie Monster and your neighbor has promised to bring you some cookies. However, she has not told you when. You have only one chance to check very quickly. Your job is to figure out when to check. You know that your neighbor will definitely put the cookies outside for you, but you do not know when. If you check and they are still not there, you have lost your chance. Your job is to decide when to open the door.*

Early condition: The cover story in the early condition is very similar to the late condition. In this condition, the cookies are definitely left for them in the beginning of the game, however, the neighbor might take them at some point.

Number of cookies will translate to a bonus money in both conditions, and in this experiment, the participants either get all the bonus in each round, or none of it.

Method

123 volunteers (43 female, 79 male, 1 unknown; mean age 31y, from 18 to 67) recruited on Amazon Mechanical Turk and each played 10 rounds of the game. Participants were randomly assigned to game lengths of 5 or 15 seconds, and to one of the early or late conditions.

Results

In this experiment, we define Δt as the time delay between the start of the game and participant's check in the early condition, and the time delay between participant's check and the end of the game in the late condition. We also calculate the number of times participants press "check" impulsively, and call it Num_p. We label the 5-second and 15-second games short and long respectively.

We hypothesize that behavior of both men and women are influenced by impatience, but they might reflect it differently. Using linear-mixed effect and models, we investigate Δt and Num_p in early and late conditions, and in the short and long duration games. Random intercept varying by subject is fit in all the models.

Women's Δt is generally affected by the experimental condition. Women in the late condition have a reliably higher Δt, which shows that they fail to wait until the end of the game to make their checks (short game: $se = 0.589$, $t = 2.168$, $p < .05$;long game: $se = 0.486$, $t = 2.197$, $p < .05$). No reliable values for men could be obtained from the data (short game:$p = 0.318$, long game: $p = 0.138$)

In the shorter game, we did not get any reliable effect for Num_p. This is sensible as 5-seconds is too short for pressing a key several times. In the longer game and in the early condition, where people should wait longer for the game to end after they make their check, we see a significant difference between Num_p of men and women (see Table 4): men's Num_p is significantly less than women's: women impulsively press the key reliably more than men ($se = 0.384$, $z = -2.053$, $p < .05$).

Table 4: Regression model predicting Num_p in the long (15-second) game. NFC is centered. Condition by itself (shown in the last two rows of the table) is not meaningful in predicting numbers pressed, since in the early condition, more time is available to press the key after the first check.

Covariate	Estimate	SE	z	$\Pr(>\lvert z\rvert)$
Intercept	2.631	0.297	8.856	$P < .0001$
NFC	-0.044	0.019	-2.284	$p < .05$
genderM	-0.794	0.385	-2.063	$< .05$
genderF:condLate	-1.571	0.392	-4.007	$p < .0001$
genderM:condLate	-0.520	0.328	-1.588	0.112

In all participants, a higher need-for-cognition trait was reliably associated with a decreased number of repeated button presses ($se = 0.019$, $z = -2.284$, $p < .05$).

We report no correlation between either Δt, or Num_p and the measured risk propensity.

Discussion

In the first experiment, we effectively moderated impatience, using faster countdowns during a 15-second waiting time. This manipulation reliably affected the quality of timing decisions of men and women. We observed differences in how impatience is reflected in behavior by each gender. Impatient men checked more frequently. Impatient women paid to activate a valueless option. Further, men were less satisfied with the game when impatient; men seeing slower counts left fewer positive comments at the end. Women, on the other hand, did not react in this way to the manipulation.

The second experiment, which is a more fine-grained analysis of existing data, showed that women reflect impatience by making their check early in the late condition. Which means that women fail to wait until the end of the game in the late condition, doing which guarantees receiving a bonus. Further, in shorter games and in the early condition, women impulsively ("impulsive" is defined by Carver, 2005 as "at tendency to act spontaneously and without deliberation") pressed a valueless key. We believe that this number represents an impulsive action made because of impatience.[2]

A major difference between the first and the second experiment is the difficulty of finding the best strategy to play. Although the rational solution of the second experiment is immensely straightforward, the best strategy for the first experiment is difficult to find for a participant using deliberative reasoning. The key to solving the game through reasoning is understanding that the hazard rate increases after each unsuccessful check, because we obtain information that the oppo-

[2]We do see a potential confound. If women were less attentive to the technical description of the task, they might have mistakenly believed that once they press the button, the game would end. If this were true, we would see an effect among low numbers of checks, because after the first few, it is evident that the trial does not end when a check is made. The actual number of checks is relatively high (mean: 10.55, range: [1,424]).

nent has not played until now, and because we know that the opponent will definitively play before the round ends.

The results from our experiments are likely compatible with a model that has men perceiving this hazard rate differently. In other words, as men become impatient, the perceived hazard rate might increase (which would explain why they play more frequently in Experiment 1). In contrast, we would model a women's reaction to impatience as an increase in impulsive actions (which would explain why they choose *live* more frequently in Experiment , press the inactive check frequently in Experiment 2, and failed to wait until the end of the game in experiment 2). Further research is required to validate such models.

Finally, men's impatience affected their overal satisfaction of the game, and reflected their impatience by leaving less positive comments. However, women's overal satisfaction of the game was not affected by the level of impatience.

Conclusion

In this paper, we compared men and women's timing decision-making using two games of timing. We found a set of interesting and surprising differences in how genders realize impatience in decision-making. The impatience effects were provoked using a visual countdown run at different speeds in a between-subject design. This manipulation created different changes in behavior in men and women. Men systematically changed the timing of their actions, even if this timing reduced their task performance: the slower the countdown that preceded the round, the more did men advance the timing of their actions. We could not detect such an effect for women. On the other hand, women expended their incentive payments on a costly (but valueless) option that allowed to view the outcome of each trial earlier. This option, however, neither affected the duration of the round, nor the outcome.

In a second, confirmatory experiment, we elicited impatience without a countdown manipulation, and found that, again, men and women behaved differently. Women showed systematically more impatience through their direct game behavior, which affected their outcome. They also showed impulsive actions that could not influence the payoff.

Understanding why people make irrational decisions requires better models of how individuals make those decisions. Rather then reflecting a hypothetical *average* human being, we strive for models that take individual differences into account. Gender is a simple and coarse distinguishing factor, which, as it turns out, is highly relevant. Still, much is not yet understood. However, the empirical comparison of strategies and biases in timing decisions warrants further analysis, not only in terms of the potential biological mechanisms, but also regarding the cognitive architecture that gives rise to such behavioral effects.

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