



Cheating Modulated by Time Pressure in the Matrix Task

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Abstract

No studies have investigated dishonesty during a time pressure extension greater than that of seconds. The objective was to determine if cheating groups report having completed a larger number of matrices than non-cheating groups in the Matrix Task, under different time pressures. In the experiment, participants were required to solve as many matrices as possible within a given time frame and then received a monetary reward for each correctly solved matrix. Participants of each cheating and non-cheating conditions were divided into three groups depending on the time pressure to solve the problems: 2.5, 5, and 10 min. Participants in the cheating group stated that they had solved more matrices than those of the non-cheating group, both under the 5-min pressure. However, the same did not happen under the time pressures of 2.5 and 10 min, indicating that time pressure modulates dishonest behavior in different ways, depending on the extent of the time pressure evaluated.

Keywords Behavioral economics · Dishonesty · Cheating · Time pressure · Decision-making

Introduction

Dishonest behavior is continuously present in everyday life. It is possible to notice it in magazines, newspapers, and among many individuals in our society. Besides the damage to society in general, dishonest behavior directly affects the economy of several countries. In the USA alone, the costs of tax evasion are approximately \$ 100 million per year (Gravelle, 2009).

Despite the considerable financial losses caused by dishonest behavior (Transparency International, 2017), it continues to be present in society. Such behavior

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involves making decisions between being honest or dishonest in a given situation. That is, to act according to established ethical standards or not. Thus, what factors lead to the choice for dishonesty?

From the assumption that individuals always seek to maximize their profits, the classical economic model (Ricardo, 1817; Smith, 1776) suggests variables that attempt to rationally explain how this decision-making occurs. In this respect, Becker (1968) argues that three main variables could explain decision-making by dishonesty: the small magnitude of possible punishment, the great magnitude of the external reward, and the small probability of being discovered in the dishonest act.

However, there are models in the area of behavioral economics (Kahneman & Tversky, 1979) that do not reduce economic decision-making to rational factors or profit-seeking behavior. Thus, Becker's model does not include a variety of situations in which individuals act honestly even when the proposed variables are present in the manner described by him. For example, studies show that people generally tend to be honest about paying their taxes, depending on the local culture, without taking into account the low probability of cheating (Lewis et al., 2012). Besides, the literature points to other variables that can influence decision-making through honesty or dishonesty, such as internal psychological factors.

Mazar et al. (2008) have shown that individuals act dishonestly to make a profit, but only to the maximum extent that they still see themselves as honest. Participants had 5 min to solve 20 matrices, and at the end had to write the number of solved matrices on the answer sheet. Participants in the group where there was the possibility of cheating tore down the original matrix test sheet before showing the answer sheet to the experimenter (cheating condition). They reported, on average, having solved a larger number of math problems of matrices than the average reported by participants in the group that had to show not only the answer sheet but also the test sheet (non-cheating condition). Participants acted dishonestly in the task if they belonged to the group where there was the possibility of cheating. Furthermore, the participants in the cheating condition only reported having solved, on average, 20% more matrices than the participants in the non-cheating condition. While classical economic theories would argue that participants would cheat to the fullest possible extent, i.e., reporting that all 20 matrices have been solved, the Personal Concept Maintenance Theory proposed by the authors argues that individuals do not do this because they can acquire the financial advantage of acting dishonestly but still maintain a positive outlook about themselves as honest people. Therefore, the maintenance of the personal concept is an internal psychological factor that directly affects the magnitude of the dishonest behavior of individuals.

Other studies have shown that dishonesty may be more present when there is an increase in the number of people acting dishonestly in the same group (Gino et al., 2013), by a reduction of self-control before a task in which people can be dishonest (Gino et al., 2011; Mead et al., 2009) and in a framework of losses instead of cheating to earn more money (Grolleau et al., 2016). Along with these factors, the literature also contains studies that correlate dishonest behavior with the final stages of a series of cheating opportunities (Effron et al., 2015), with creativity (Gino & Ariely, 2012; Gino & Wiltermuth, 2014; Wiltermuth et al., 2017), with the lack of sleep (Barnes et al., 2011), and with the time of day at the time of decision-making

(Kouchaki & Smith, 2014). Despite the several variables studied and their relationships with dishonesty, few studies have evaluated an essential factor in any decision-making: time pressure, i.e., how much time the individual has for decision-making.

Time pressure is a very important variable in decision-making because, since acting honestly or dishonestly involves evaluating the costs and benefits of a given action, the time taken to assimilate this cognitive process directly affects the choice to be made (Lohse et al., 2018). Shalvi et al. (2012) sought to establish a relationship between time pressure and dishonesty. The authors were interested in investigating whether the first response (automatic response) to the possibility of cheating would be dishonest or honest. In the experimental task, participants had a limited time to privately roll a die and report the outcome to determine their payment. Considering the time pressures, i.e., the time limits for the participant's response, from 8 s for the high time pressure group to 20 s for the low time pressure group, it was possible to establish the relationship between time pressure and dishonesty under these experimental conditions. The results showed that, under high time pressure, the participants cheated more than the individuals in the low time pressure group. The authors suggested that the automatic tendency of individuals is to cheat under high temporal pressure when they have the possibility to do so.

On the other hand, other studies have suggested an opposite effect, showing that higher time pressure causes individuals to act honestly (Capraro, 2017; Capraro et al., 2019; Lohse et al., 2018). Capraro (2017) used one-shot deception games with different groups, under the time pressure of 5 s or 30 s each. The participants in the higher time pressure group responded honestly when compared to the participants in the group with the lower time pressure. These results corroborate the work of Lohse et al. (Lohse et al., 2018). They evaluated the role of time pressure in dishonesty and the role of the contemplation condition, in which the participants have enough time to evaluate the task. The participants could report a performance different from the one generated by the software-programmed lottery, thus having the possibility to cheat on the proposed task. Participants in a group with the lowest time pressure had 60 s to report the lottery results, while in a group with the highest time pressure, they had 8 s. The results showed that the participants in the higher time pressure group acted significantly more honestly than those in the lower time pressure group.

It is important to point out that the literature shows studies comparing only two conditions: one with high time pressure and the other with low time pressure (Capraro et al., 2019; Lohse et al., 2018; Shalvi et al., 2012). Despite its relevance, such a comparison does not allow one to observe dishonest behavior under various time pressures, which could lead to different conclusions on how time pressure modulates dishonesty.

Several studies sought to assess the relationship between time pressure and dishonest behavior using a scale of seconds, measuring mainly the automatic behavior of individuals in situations where cheating was possible (Bereby-Meyer & Shalvi, 2015; Capraro, 2017; Capraro et al., 2019; Lohse et al., 2018; Shalvi et al., 2012; Verschuere & Shalvi, 2014). However, it is important to evaluate the time pressure on larger time scales, since time pressure does not only refer to the temporal effect on spontaneous behavior but also permits the study of different

complex cognitive processes such as awareness, self-control, and cognitive load (Lohse et al., 2018; Mead et al., 2009; Moore & Tenbrunsel, 2014; Van't Veer et al., 2014). Dishonesty evaluation procedures that are performed on the minute scale such as the Matrix Task (Gino & Ariely, 2012; Gino & Wiltermuth, 2014; Gino et al., 2010, 2011; Mazar et al., 2008; Mead et al., 2009; Rosenbaum et al., 2014), to the best of our knowledge, have never been associated with studies that took into account the relationship between dishonesty and time pressure. Studies of time perception have concluded that exposure to a stimulus of temporal extension of more than a few seconds leads to different cognitive processing over time compared to stimuli of shorter duration (Casilimas-Díaz & Bueno, 2019; Droit-Volet et al., 2013; Nather et al., 2011).

One of these cognitive processes that is intertwined with the duration of a task is the ability to manage one's self-control during a decision-making period. Different papers have found that the depletion of self-control leads to higher dishonesty behavior (Gino et al., 2011; Mead et al., 2009). Other papers discuss that the cognitive process of contemplation during experiments, defined as a process in which people take some time to reflect introspectively about the opportunity to cheat, can increase honest behavior (Gunia et al., 2012; Lohse et al., 2018). Furthermore, some papers relate the cognitive load, which can be increased with the time participants spend in a task, as a reason why participants act more honestly or dishonestly during the experiments (Moore & Tenbrunsel, 2014; Van't Veer et al., 2014). Thus, the use of methodologies to study dishonest behavior during extended periods and under several time pressures is relevant to access underlying cognitive processes during participants' decision-making.

In order to take into account the processes involved between time pressure and dishonesty, this study used the Matrix Task to analyze the effects of extended periods of time pressure on dishonest behavior. These time pressures are higher than those described in previous studies and do not assume an automatic response for decision-making. The study also aimed to better explain how several time pressures can modulate dishonesty evaluating dishonest behavior in more than two time pressures. The time pressure conditions were based upon the most common time pressure found in the literature regarding the Matrix Task: 5 min. From this baseline, it was possible to determine the other time pressures, one that is half of the original time pressure and one that doubles it.

Materials and Methods

Participants

Ninety-two individuals (38 men) participated in the study. All participants were students from the local university. They were personally invited to participate during their classes. The participants were informed that the objective of the study was to evaluate their performance during a task. The only selection criterion was to be a student at the University of São Paulo. They had the opportunity to earn money depending on their performance in the experimental task. The procedures were

approved¹ by the Research Ethics Committee of the Faculty of Philosophy, Science and Letters of Ribeirão Preto. Participants signed a consent form before the start of the experiments.

Instruments and Experimental Setting

All participants had access to a chair and a desk that was used to perform the tasks. Each participant also had three pencils with a rubber on the tip, so they could correct their mistakes during the procedure. The experiment was conducted in an isolated room under controlled temperature and illumination. Besides the students' chairs, there was a desk and a chair in which the experimenter would sit, facing the participants. On the side of this desk, there was a trash can that was used in some experimental conditions.

Procedure

The experiments were carried out in a room on lots of 7–8 students per experimental session, all of them were under the same ethical condition (cheating or non-cheating) and the same condition of time pressure (2.5, 5, or 10 min). The experimenter was present and the participants were instructed not to interact with each other. The students received all the instructions orally from the experimenter to carry out the Matrix Task.

Participants also received a sheet describing the task and an example of how it should be performed. Therefore, they knew exactly all the steps of the experiment. Each participant received a test sheet with 20 matrices inside an envelope and another envelope containing an answer sheet, where they were supposed to write the number of matrices they would solve correctly. Each array included the distribution of 12 three-digit numbers (for example, 7.86) into three rows and four columns. To solve each matrix, the participants had a time limit to find two numbers per matrix which, together, resulted in 10. In all conditions, participants received 1 Brazilian Real (Brazilian currency) for each matrix that they claimed to have correctly resolved when delivering the answer sheet.

In the 2.5-min-non-cheating group ($n=16$), after the 2.5 min of the task had elapsed, the participants counted the number of matrices they had successfully solved and then wrote their number on the answer sheet and handed it to the experimenter. The experimenter checked the number of correct answers as soon as the students handed him the test sheet and the answer sheet, using a template. Next, the experimenter paid each participant based on his performance.

At the end of the 2.5-min-cheating group ($n=14$), participants were asked to count the number of matrices they had successfully solved, tear the test sheet, and place it in the trash can in the corner of the room. Only then did they write the number of matrices resolved on the answer sheet. Finally, they delivered the answer

¹ Approval's protocol number from the Research Ethics Committee: 74,131,617.5.0000.5407.

sheet to the experimenter, who paid them based on each participant's reported performance without checking the data presented by each one. In this condition, the participants had the opportunity to falsely report a higher level of performance on the task to earn more money.

In the 5-min-non-cheating ($n = 15$), 5-min-cheating ($n = 15$), 10-min-non-cheating ($n = 16$), and 10-min-cheating groups ($n = 16$), the procedure occurred in the same way as described above for non-cheating and cheating conditions, except for the time limit for performing the Matrix Task, which varied according to the group to which the participants were allocated. Therefore, the experiment is a 2×3 : the first treatment is the non-cheating group versus cheating group. The second treatment is the time pressure for executing the Matrix Task with three levels (2.5, 5, and 10 min).

The difference in performance between non-cheating and cheating groups was the measure of dishonesty of the participants. The selection of participants in each one of the two groups was random.

After completing the Matrix Task, the participants completed a post-experiment questionnaire, as a manipulation check, asking them: if there was any difficulty during the experiment; if they were able to follow the instructions; if something interfered with their concentration; if they considered the reward of the task fair; and if they judged the time for the task to be short. The purpose of these questions was first to assess whether the participants perceived the time pressure of the task and to eliminate from the analysis any participants who did not understand the task.

Statistical Analysis

For the statistical analysis, it was used the software SPSS – Version 23. ANOVA was used for statistical analysis and the significance level (alpha) was 5%. We merged the three-time pressure values for the comparison between the cheating and non-cheating groups, and a one-way ANOVA was carried out. The cheating and non-cheating condition was considered as an independent variable and the average number per minute of the matrices reported as resolved as a dependent variable. For the comparison between cheating and non-cheating groups considering the time pressures, a two-way ANOVA was used. The dependent variable was the mean number per minute of matrices reported as solved and the independent variables were the conditions (cheating and non-cheating) and time pressures (2.5, 5, and 10 min). Bonferroni procedure was used as a post hoc test.

Results

The reported number of matrices solved was presented as means per minute. The difference in performance between the groups was the measure of the degree of dishonesty of the participants. A Breusch-Pagan test was performed on each of the ANOVA models, showing that we cannot reject the null hypothesis of homoscedasticity. One-way ANOVA detected a significant difference in the means per minute of

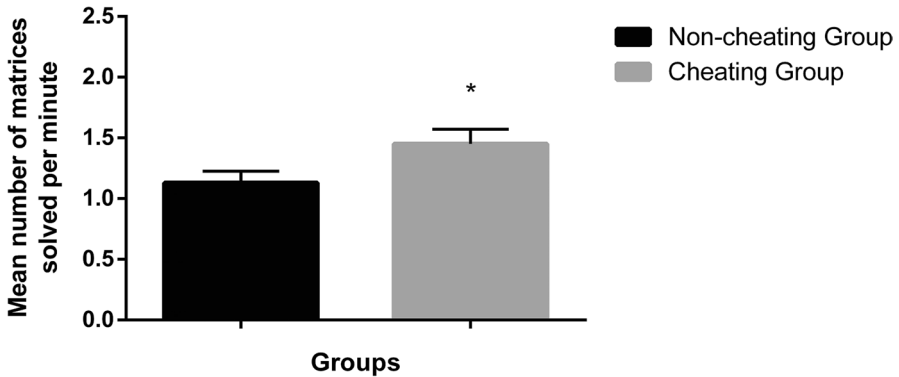


Fig. 1 Number per minute of matrices solved by non-cheating and cheating groups considering all time pressures. Error bars represent the standard error of the mean

the matrices reported as resolved between the grouped non-cheating conditions and the grouped cheating conditions (Fig. 1). The participants of the cheating groups, considering all time pressures, reported having resolved more matrices than the participants of the non-cheating groups ($M=1.45$, $SD=0.82$ vs. $M=1.13$, $SD=0.66$, $F(1; 86)=5.20$, $p=0.03$).

Two-way ANOVA of the mean numbers per minute revealed a significant difference between the non-cheating group and the cheating group for the same time pressure. The participants of the cheating group under the time pressure of 5 min filled the sheet of paper with a significantly higher number of resolved matrices than the participants of the 5-min non-cheating groups, considering the averages per minute ($M=1.43$, $SD=0.78$ vs. $M=0.80$, $SD=0.43$, $F(1.28)=7.42$, $p=0.01$).

However, statistical analysis revealed that there was no significant difference between the number of matrices reported by the non-cheating and cheating groups under the time pressure of 2.5 min, considering the means per minute ($F(1; 28)=1.58$, $p=0.22$). There was also no significant difference between the non-cheating and cheating groups under the 10-min time pressure ($F(1; 30)=0.02$, $p=0.90$) (Fig. 2).

All participants reported in the post-experiment questionnaire that the amount of time to solve all matrices was insufficient.

Discussion

The results show that when grouping the participants of the three time pressures, the participants from the cheating groups reported having solved more matrices than the non-cheating groups on average. Furthermore, the data show that the participants in the cheating group, under the 5-min time pressure, reported having solved more matrices than the non-cheating group submitted to the same time pressure. However, no significant differences were observed between the cheating groups and the non-cheating groups under the time pressures of 2.5 min or 10 min.

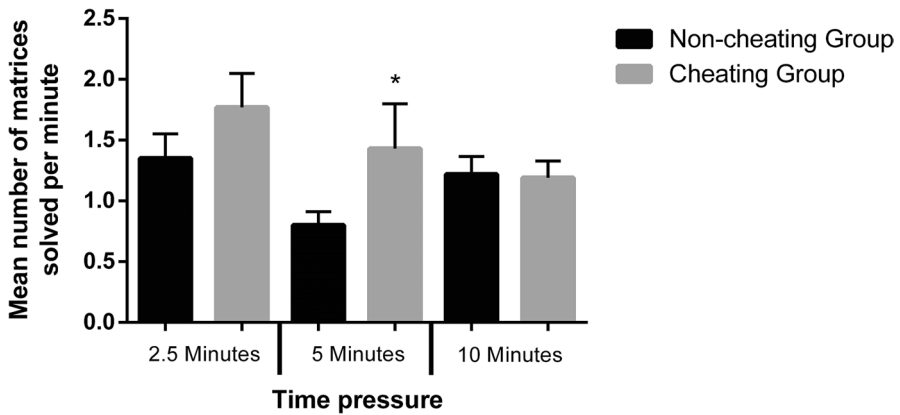


Fig. 2 Number per minute of matrices solved during time pressure of 2.5, 5, and 10 min. Error bars represent the standard error of the mean

The novelty of using several minutes as time pressure showed how extended periods in a task can affect dishonest behavior. The results also did not show a direct relationship between dishonest behavior and different time pressures, such as with the higher/lower time pressure, the higher/lower is dishonest behavior. The use of three time pressures, and not only two, allowed the complexity of dishonesty behavior to be visible through the data presented. Thanks to this approach, it was not implicit that a high or low time pressure is responsible for determining how one will behave ethically. On the contrary, the results show how other cognitive processes such as awareness, self-control, and cognitive load (Lohse et al., 2018; Mead et al., 2009; Moore & Tenbrunsel, 2014; Van't Veer et al., 2014), along with minute time pressure, may influence dishonest behavior during tasks that aim for a deliberate response of the individual, rather than an automatic one occurring within seconds (Suchotzki et al., 2017). A meta-analysis by Köbis et al. (2019) suggests that there is an intuitive self-appeal of dishonesty when no concrete person is harmed by one's cheating in a given task. Here, the intuitive self-appeal of dishonesty was equal across all conditions, since the time for reporting the answers was the same in all groups.

The results of this study reaffirm the Matrix Task as a reliable method for studying cheating behavior experimentally. Several investigators have used the Matrix Task to determine the existence of dishonest behavior in individuals based on the possibility of cheating to obtain greater profits. In these studies, the Matrix Task procedure was always performed under the time pressure of 4 or 5 min (Gino & Ariely, 2012; Gino & Mogilner, 2014; Gino & Wiltermuth, 2014; Gino et al., 2010, 2011, 2013; Mazar et al., 2008; Mead et al., 2009; Ruedy et al., 2013; Shu et al., 2011; Wiltermuth, 2011). The present results qualitatively and quantitatively resemble those reported in the literature. So that, in the Matrix Task under 5-min time pressure, participants in the group where there was the possibility of cheating reported solving a larger number of matrices than those in the group where there was no such possibility. Besides, the present results, as well as those of the literature, show that the participants in the

cheating group do not act in such a way as to reach the maximum possible profit in the task, which would correspond to a profit of 20 Brazilian Reais (BRL). Instead, they seem to cheat only to the extent that they can make a profit, but still retain what Mazar et al. (2008) called a positive view of themselves as honest people, which is the basis of the authors' Personal Concept Maintenance Theory. However, it was not possible to observe the same behavior under the time pressures of 2.5 min and 10 min, which, until then, had not yet been evaluated in previous studies.

Under the time pressures of 2.5 min and 10 min, individuals in the cheating group showed choices similar to those of the honest group, reporting on average the same number of matrices solved as those reported by the non-cheating group. This fact highlights the importance of studying the influence of time pressure on dishonest behavior since this temporal variable seems to alter the deliberate choice between cheating or not. The different time pressures led to distinctive manifestations of dishonesty behavior, depending on the duration of the task.

Since the main objective of the study was to determine how time pressure modulates dishonest behavior, it is possible to compare its results to those obtained in other studies that set out to investigate the same variables. The present results indicate that time pressure is, in fact, capable of modulating dishonest behavior (Capraro, 2017; Capraro et al., 2019; Lohse et al., 2018; Shalvi et al., 2012; Van der Cruyssen et al., 2020). However, in contrast to other reports, it is not possible to state generally whether high or low time pressure leads to dishonesty or not (Suchotzki et al., 2017). This is because the results obtained showed that neither the low time pressure nor the high time pressure in the intervals applied in this study caused the individuals to cheat. Cheating behavior occurred only for the intermediate time pressure group. While some studies have shown that increased time pressure also increases the chances of dishonest behavior (Shalvi et al., 2012), others have pointed out an exactly opposite relationship whereby increased time pressure on decision-making leads to honesty in the responses (Capraro, 2017; Capraro et al., 2019; Lohse et al., 2018; Suchotzki et al., 2017).

The present results show that to analyze how time pressure acts on dishonest behavior it is necessary to evaluate more than two time pressures experimentally. The divergent results found in the literature may be due to the comparison between only two distinct groups: one with less time pressure and the other with higher time pressure. Therefore, if a simple comparison between the 2.5-min time pressure and the 5-min time pressure was made, one would erroneously conclude that lower time pressures are responsible for dishonest behavior since, under the 5-min time pressure, the cheating group was the only one who cheated. Equally, another simple comparison between the 10-min time pressure and the 5-min time pressure would lead to the erroneous conclusion that higher time pressures are responsible for dishonest behavior. Our procedure involving more than two-time pressures permits us to observe how dishonest behavior develops over various time pressures. No significant differences were found between groups with the possibility of cheating and those without the possibility of cheating under time pressures of 2.5 min and 10 min. However, it was possible to find such a difference between groups under time pressures of 5 min, the same duration previously reported in the literature (Gino & Ariely, 2012; Gino et al., 2010; Mazar et al., 2008; Mead et al., 2009). These data reveal

that time pressure does seem to modulate dishonest behavior, but in a more complex way than previously presented.

Experiments involving cheating use time pressures of a few seconds within procedures of group surveys or dice rolling tasks (Capraro, 2017; Lohse et al., 2018; Shalvi et al., 2012), examining how the automatic response of the individual to the possibility of cheating in a task is given. On the other hand, the Matrix Task uses time pressures of several minutes. Thus, the interest of this study was also to look for a methodology that would permit more time for the response, with the Matrix Task procedure. This methodology would allow the observation of the behavioral manifestation of the response under different time pressures. The results show that dishonest behavior cannot be explained by the simple presence of time pressure, but can also be modulated by other parameters such as the extension in seconds or minutes of time pressure. Thus, high time pressure may elicit or not dishonest behavior, depending on whether the time pressure manipulated consists of a few seconds or minutes.

As the experiments dealt with larger time scales, other cognitive processes may be associated with participants' decision-making about dishonesty or honesty in our study. Some studies have found, for example, a relationship that can be established between self-control depletion and an increase in dishonest behavior (Barnes et al., 2011; Gino et al., 2011; Kouchaki & Smith, 2014; Mead et al., 2009). It could be argued that with the extended duration of the Matrix Task, self-control would be depleted along the time, which could lead to an increased number of reportedly solved matrices in the cheating group. However, participants that endured the Matrix Task for 10 min did not seem to have cheated when comparing cheating and non-cheating groups during the 10-min time pressure. Nonetheless, some authors attribute the honesty observed in low time pressure conditions to the cognitive process of contemplation (Gunia et al., 2012; Lohse et al., 2018). One cognitive process that is associated with time pressure and cheating is the cognitive load that is present during the Matrix Task. Several studies sought to relate an increase in cognitive load during experiments with dishonest behavior (Moore & Tenbrunsel, 2014; Van't Veer et al., 2014). Nevertheless, the results are still incongruent, and this relationship is not well established yet.

Another cognitive process that still needs to be further investigated is the one involving dishonesty and the perception to cheat in a given task. Lohse et al. (2018) argue that higher temporal pressure can lead to honest responses by making it difficult for the individual to perceive the possibility of cheating. Thus, the lack of perception regarding the possibility of cheating could explain why cheating was not observed in the comparison between the non-cheating and cheating groups under the time pressure of 2.5 min. Although the task instructions were previously explained to the participants, a procedure which would give them a chance to perceive the possibility of cheating and to obtain greater profit in the task, the high time pressure might have influenced the perception of the chance to behave dishonestly. On the other hand, this factor would not explain why dishonest behavior was not observed in the comparison between groups under the 10-min time pressure.

Although we did not intend to modulate the financial incentive per group, the number of trials was greater for the 10-min pressure than the others as the

participants had more time to solve the matrices. The same could be considered for the differences between 2.5- and 5-min time pressures. However, if there were a specific effect of the incentive value, the group with the pressure of 2.5 min, with less incentive during the total opportunities of the session, would have to have different performance, in the comparison between the cheating and non-cheating groups, than for the 5- and 10-min time pressure. The results showed only a difference between the cheating and non-cheating groups in the 5 min, an intermediate time pressure and incentive value. So, other cognitive and motivational variables may explain participants' honest behavior.

In the study by Mazar et al. (2008), the dishonest behavior, which occurred with gains of 25 cents and 50 cents per matrix solved, was not observed when the participants earned 2.5 dollars and 5 dollars per matrix solved. The authors argue that this is due to the maintenance of the personal concept of the individual, who is not able to cheat with large amounts because if he did, he could not perceive himself as honest. In the present study, one can notice that participants who had 10 min to perform the task of the matrices solved more matrices and thus earned more money at the end of the task, on average. While the participants in the non-cheating group who had 10 min to perform the Matrix Task were rewarded, on average, with 12.19 BRL, the participants in the non-cheating group who had 5 min to perform the Matrix Task were rewarded with 4 BRL. It is possible that while the participants in the group under the 10-min time pressure perceived that they could cheat on the task, they did not do so because they received a satisfactory reward, which did not justify the loss of their personal concept for greater profit. Thus, at the end of the 10-min task, the high-profit value obtained may have suppressed dishonest behavior by the participants. Furthermore, the separation between the magnitude of the reward effect and the time pressure could be examined with a procedure that offers a smaller reward for lower time pressures. Thus, the rewards for the Matrix Task could be similar for the groups under different time pressures at the end of the procedure.

The time pressure of 5 min seems, therefore, to be more effective to stimulate dishonest behavior in the Matrix Task. It allows the participant to perceive the possibility of cheating on the task, while at the same time, the attainable profit obtained under this time pressure is not large enough to suppress the dishonest behavior.

In conclusion, the results indicate that only the intermediate time pressure of 5 min in the Matrix Task showed a difference between cheating and non-cheating groups regarding dishonesty. While using more than two time pressures in the experimental design, it was possible to investigate how time pressure modulates dishonest behavior across time. Evaluating time pressure during extended periods also permitted the study of deliberate ethical decision-making, which has proven to be a more complex phenomenon than a direct relationship with time pressure. The analysis of time pressure on a minute scale allowed the influence of different cognitive processes — such as self-control, cognitive load, and cheating perception — that can be better exploited during long-duration procedures. Since this is the first study to use three time pressures in the Matrix Task, a higher sample size could offer more robust results and increase the reliability of our statements. Future studies can vary participants' rewards accordingly to better explain how financial incentives can modulate dishonest behavior. Moreover, upcoming studies should also incorporate

multiple time pressures in their experimental design, as well as a plethora of time pressure extensions to investigate and incorporate all forms in which ethical decision-making is presented in society.

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Data Availability The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

Materials Availability Not applicable.

Code Availability Not applicable.

Declarations

Ethics Approval The procedures were approved by the Research Ethics Committee of the Faculty of Philosophy, Sciences, and Letters of Ribeirão Preto, University of São Paulo.

Consent to Participate Participants signed a consent form before the start of the experiments.

Consent for Publication The authors have agreed to submit the manuscript for publication.

Conflict of Interest The authors declare no competing interests.

References

- Barnes, C. M., Schaubroeck, J., Huth, M., & Ghumman, S. (2011). Lack of Sleep and Unethical Conduct. *Organizational Behavior and Human Decision Processes*, *115*(2), 169–180. <https://doi.org/10.1016/j.obhdp.2011.01.009>
- Becker, G. S. (1968). Crime and Punishment: An Economic Approach. *Journal of Political Economy*, *76*(2), 169–217. <https://doi.org/10.1002/9780470752135.ch25>
- Bereby-Meyer, Y., & Shalvi, S. (2015). Deliberate Honesty. *Current Opinion in Psychology*, *6*, 195–198. <https://doi.org/10.1016/j.copsyc.2015.09.004>
- Capraro, V. (2017). Does the Truth come Naturally? Time Pressure Increases Honesty in one-shot Deception Games. *Economics Letters*, *158*, 54–57. <https://doi.org/10.1016/j.econlet.2017.06.015>
- Capraro, V., Schulz, J., & Rand, D. G. (2019). Time Pressure and Honesty in a Deception Game. *Journal of Behavioral and Experimental Economics*, *79*, 93–99. <https://doi.org/10.1016/j.socec.2019.01.007>
- Casilimas-Díaz, D. A., & Bueno, J. L. O. (2019). Synchronising to a Frequency while Estimating Time of Vibro-tactile Stimuli. *Experimental Brain Research*, *237*(5), 1257–1266. <https://doi.org/10.1007/s00221-019-05504-3>
- Droit-Volet, S., Ramos, D., Bueno, J. L. O., & Bigand, E. (2013). Music, Emotion, and Time Perception: The Influence of Subjective Emotional Valence and Arousal? *Frontiers in Psychology*, *4*(217), 1–12. <https://doi.org/10.3389/fpsyg.2013.00417>
- Effron, D. A., Bryan, C. J., & Murnighan, J. K. (2015). Cheating at the end to Avoid Regret. *Journal of Personality and Social Psychology*, *109*(3), 395–414. <https://doi.org/10.1037/pspa0000026>

- Gino, F., & Ariely, D. (2012). The Dark Side of Creativity: Original Thinkers can be more Dishonest. *Journal of Personality and Social Psychology*, 102(3), 445–459. <https://doi.org/10.1037/a0026406>
- Gino, F., & Mogilner, C. (2014). Time, Money, and Morality. *Psychological Science*, 25(2), 414–421. <https://doi.org/10.1177/0956797613506438>
- Gino, F., & Wiltermuth, S. S. (2014). Evil genius? How Dishonesty can Lead to Greater Creativity. *Psychological Science*, 25(4), 973–981. <https://doi.org/10.1177/0956797614520714>
- Gino, F., Norton, M. I., & Ariely, D. (2010). The counterfeit self. *Psychological Science*, 21(5), 712–720. <https://doi.org/10.1177/0956797610366545>
- Gino, F., Schweitzer, M. E., Mead, N. L., & Ariely, D. (2011). Unable to Resist Temptation: How Self-control Depletion Promotes Unethical Behavior. *Organizational Behavior and Human Decision Processes*, 115(2), 191–203. <https://doi.org/10.1016/j.obhdp.2011.03.001>
- Gino, F., Ayal, S., & Ariely, D. (2013). Self-serving altruism? The Lure of Unethical Actions that Benefit others. *Journal of Economic Behavior and Organization*, 93, 285–292. <https://doi.org/10.1016/j.jebo.2013.04.005>
- Gravelle, J. G. (2009). Tax havens: International tax avoidance and evasion. *National Tax Journal*, 62(4), 727–753. <https://doi.org/10.2307/41790645>
- Grolleau, G., Kocher, M. G., & Sutan, A. (2016). Cheating and Loss aversion : Do People Cheat more to avoid a Loss ? *Management Science*, 62(12), 3428–3438. <https://doi.org/10.1287/mnsc.2015.2313>
- Gunia, B. C., Wang, L., Huang, L., Wang, J., & Murnighan, J. K. (2012). Contemplation and Conversation: Subtle Influences on Moral Decision Making. *Academy of Management Journal*, 55(1), 13–33. <https://doi.org/10.5465/amj.2009.0873>
- Kahneman, D., & Tversky, A. (1979). Prospect theory : An Analysis of Decision Under Risk. *Econometrica*, 47(2), 263–292. <https://doi.org/10.2307/1914185>
- Köbis, N. C., Verschuere, B., Bereby-Meyer, Y., Rand, D., & Shalvi, S. (2019). Intuitive Honesty Versus Dishonesty: Meta-analytic Evidence. *Perspectives on Psychological Science*, 14(5), 778–796. <https://doi.org/10.1177/1745691619851778>
- Kouchaki, M., & Smith, I. H. (2014). The Morning Morality Effect: The Influence of Time of day on Unethical Behavior. *Psychological Science*, 25(1), 95–102. <https://doi.org/10.1177/0956797613498099>
- Lewis, A., Bardis, A., Flint, C., Mason, C., Smith, N., Tickle, C., & Zinser, J. (2012). Drawing the line somewhere: An experimental study of moral compromise. *Journal of Economic Psychology*, 33(4), 718–725. <https://doi.org/10.1016/j.joep.2012.01.005>
- Lohse, T., Simon, S. A., & Konrad, K. A. (2018). Deception Under Time Pressure: Conscious Decision or a Problem of Awareness? *Journal of Economic Behavior and Organization*, 146, 31–42. <https://doi.org/10.1016/j.jebo.2017.11.026>
- Mazar, N., Amir, O., & Ariely, D. (2008). The Dishonesty of Honest People: A Theory of Self-concept Maintenance. *Journal of Marketing Research*, 45(6), 633–644. <https://doi.org/10.1509/jmkr.45.6.633>
- Mead, N. L., Baumeister, R. F., Gino, F., Schweitzer, M. E., & Ariely, D. (2009). Too Tired to Tell the Truth: Self-control Resource Depletion and Dishonesty. *Journal of Experimental Social Psychology*, 45(3), 594–597. <https://doi.org/10.1016/j.jesp.2009.02.004>
- Moore, C., & Tenbrunsel, A. E. (2014). “Just Think about it”? Cognitive Complexity and Moral Choice. *Organizational Behavior and Human Decision Processes*, 123(2), 138–149. <https://doi.org/10.1016/j.obhdp.2013.10.006>
- FC Nather, JLO Bueno, E Bigand, & S Droit-Volet (2011). Time Changes with the Embodiment of Another’s Body Posture. *PLoS ONE* 6(5) <https://doi.org/10.1371/journal.pone.0019818>
- Ricardo, D. (1817). *Principles of Political Economy and Taxation*. John Murray.
- Rosenbaum, S. M., Billinger, S., & Stieglitz, N. (2014). Let’s be Honest: A Review of Experimental Evidence of Honesty and Truth-telling. *Journal of Economic Psychology*, 45, 181–196. <https://doi.org/10.1016/j.joep.2014.10.002>
- Ruedy, N. E., Moore, C., Gino, F., & Schweitzer, M. E. (2013). The Cheater’s High: The unexpected Affective Benefits of Unethical Behavior. *Journal of Personality and Social Psychology*, 105(4), 531–548. <https://doi.org/10.1037/a0034231>
- Shalvi, S., Eldar, O., & Bereby-Meyer, Y. (2012). Honesty Requires Time (and lack of justifications). *Psychological Science*, 23(10), 1264–1270. <https://doi.org/10.1177/0956797612443835>
- Shu, L. L., Gino, F., & Bazerman, M. H. (2011). Dishonest Deed, Clear Conscience: When Cheating Leads to Moral Disengagement and Motivated Forgetting. *Personality and Social Psychology Bulletin*, 37(3), 330–349. <https://doi.org/10.1177/0146167211398138>

- Smith, A. (1776). *The Wealth of Nations*. W Strahan and T Cadell
- Suchotzki, K., Verschuere, B., Van Bockstaele, B., Ben-Shakhar, G., & Crombez, G. (2017). Lying takes Time: A meta-analysis on Reaction Time Measures of Deception. *Psychological Bulletin*, *143*(4), 428–453. <https://doi.org/10.1037/bul0000087>
- Transparency International. (2017). *Corruption Perception Index*. Corruption Perception Index 2017
- Van der Cruyssen, I., Dhondt, J., Meijer, E., & Verschuere, B. (2020). Does Honesty Require Time? Two Preregistered Direct Replications of Experiment 2 of Shalvi, Eldar, and Bereby-Meyer (2012). *Psychological Science*, *31*(4), 460–467. <https://doi.org/10.1177/0956797620903716>
- Vanf Veer, A. E., Stel, M., & Van Beest, I. (2014). Limited Capacity to Lie: Cognitive Load Interferes with Being Dishonest. *Judgment and Decision Making*, *9*(3), 199–206. <https://doi.org/10.2139/ssrn.2351377>
- Verschuere, B., & Shalvi, S. (2014). The Truth Comes Naturally! Does it? *Journal of Language and Social Psychology*, *33*(4), 417–423. <https://doi.org/10.1177/0261927X14535394>
- Willemuth, S. S. (2011). Cheating More when the Spoils are Split. *Organizational Behavior and Human Decision Processes*, *115*(2), 157–168. <https://doi.org/10.1016/j.obhdp.2010.10.001>
- Willemuth, S. S., Vincent, L. C., & Gino, F. (2017). Creativity in Unethical Behavior Attenuates Condemnation and Breeds Social Contagion when Transgressions seem to Create Little Harm. *Organizational Behavior and Human Decision Processes*, *139*, 106–126. <https://doi.org/10.1016/j.obhdp.2017.01.006>

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