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van 't Veer, Anna E.; Stel, Marielle; van Beest, Ilja

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# Limited capacity to lie: Cognitive load interferes with being dishonest

Anna E. van 't Veer\*

Mariëlle Stel<sup>†</sup>

Ilja van Beest<sup>†</sup>

## Abstract

The current study tested the boundary conditions of ethical decision-making by increasing cognitive load. This manipulation is believed to hinder deliberation, and, as we argue, reduces the cognitive capacity needed for a self-serving bias to occur. As telling a lie is believed to be more cognitively taxing than telling the truth, we hypothesized that participants would be more honest under high cognitive load than low cognitive load. 173 participants anonymously rolled a die three times and reported their outcomes — of which one of the rolls would be paid out — while either under high or low cognitive load. For the roll that determined pay, participants under low cognitive load, but not under high cognitive load, reported die rolls that were significantly different from a uniform (honest) distribution. The reported outcome of this roll was also significantly higher in the low load condition than in the high load condition, suggesting that participants in the low load condition lied to get higher pay. This pattern was not observed for the second and third roll where participants knew the rolls were not going to be paid out and where therefore lying would not serve self-interest. Results thus indicate that having limited cognitive capacity will unveil a tendency to be honest in a situation where having more cognitive capacity would have enabled one to serve self-interest by lying.

Keywords: deception, cognitive processing capacity, morality, dual system, decision-making.

## 1 Introduction

Deception — intentionally misleading another person — is an omnipresent phenomenon that at times can greatly facilitate social interaction, but at other times can cause immense harm, pain and have grave financial consequences. Telling a lie often comes with justifications and with biases that permit people to lie (e.g., a self-serving bias) that likely happen out of conscious awareness. Yet, arguably, even these biases may take up some cognitive capacity. Here we test whether the decision to tell a lie is born out of our intuitive, automatic tendency to do so or whether this unethical behavior is a result of more effortful cognitive processing. We do so by manipulating the availability of processing resources in an anonymous, tempting situation where dishonest behavior is typically observed. In other words, we test whether having a limited cognitive processing capacity makes people more honest than when they do have processing resources available.

Thus far, research on social decision-making has made use of a framework that divides the decision process into two systems (i.e., a dual-system framework; e.g., Evans,

2003; Haidt, 2001; Kahneman, 2011, but see Keren & Schul, 2009, for a critical evaluation). When making a decision, people are believed to rely both on automatic, sometimes called intuitive, processes, and more deliberative or controlled processes. In the case of moral decision-making, this dual-system framework has left researchers with evidence pointing in opposite directions. On the one hand, some have argued people have an intuitive sense to be prosocial and ethical. For instance, Rand, Greene, and Nowak (2012) find in several studies that people are intuitively cooperative. Some of these findings, however, have recently been questioned by Tinghög and colleagues (2013). The issues raised seem to center mainly around the studies using time pressure to bring about an automatic response, but not around other manipulations used, like inducing an intuitive mindset. Using methods to elicit intuitive decision making, Zhong (2011) also found intuition decreased the use of deception and increased altruism, strengthening to the notion the people are intuitively prosocial. On the other hand, others have argued that it takes deliberation to decide to do the right thing, as it was found that people's response under time-pressure was to be dishonest (Shalvi, Eldar, & Bereby-Meyer, 2012) and that contemplation leads to more ethical decisions (Gunia, Wang, Huang, Wang, & Murnighan, 2012). Findings from studies investigating unethical behavior — and especially those investigating deception — thus paint an inconsistent picture.

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\*Department of Social Psychology & TIBER (Tilburg Institute for Behavioral Economics Research), Tilburg University, The Netherlands: A.vtveer@tilburguniversity.edu.

<sup>†</sup>Department of Social Psychology & TIBER, Tilburg University.

A broad range of findings suggests that deception is cognitively taxing. First, evidence from evolutionary (Byrne & Corp, 2004) and developmental (Hala & Russell, 2001) research suggests deception involves complex cognitive processes. Second, relative to truthful responding, lying shows an increase in response time (Farrow et al., 2003; Spence et al., 2001) and an increase in cognitive effort as measured by pupil dilation (Wang, Spezio, & Camerer, 2010). Neuroimaging studies typically find lies elicit more activation in the brain than truths (Ganis, Kosslyn, Stose, Thompson, & Yurgelun-Todd, 2003; Langleben et al., 2002; Lee et al., 2009), and consider the truth the “baseline” (Spence et al., 2004). Third, in the lie-detection literature, telling a lie is assumed to be more cognitively taxing: One has to make up a story, tell it coherently, monitor one's own and the other persons' demeanor, and, arguably, regulate one's feelings about being unethical at the same time (Vrij et al., 2008; Zuckerman, Depaulo, & Rosenthal, 1981). Fourth, a process of justifying dishonest behavior is likely to take place when there is ample opportunity to do so (Shalvi, Dana, Handgraaf, & De Dreu, 2011), assumingly in order to maintain a positive self-image (Mazar, Amir, & Ariely, 2008). Even this kind of self-serving tendency, however widespread or unconscious, seems to take up some form of cognitive processing. Given the evidence outlined above, we argue that lying is cognitively taxing, and that it thus should not be observed when cognitive capacity is unavailable.

However, a study in which participants had the opportunity to lie to serve their self-interest indicated that participants were more dishonest with time-pressure than without it (Shalvi et al., 2012). Authors of this study interpreted this finding by suggesting that dishonesty is people's automatic tendency when self-interest can be served. In reply, however, Foerster, Pfister, Schmidts, Dignath, and Kunde (2013) noted that this finding might be due to specifics in the procedure, namely that participants could have decided on their response while apprehending the task. Foerster et al. did not impose time-pressure but manipulated response time by asking their participants to report an outcome of a die roll immediately, or after a short delay. Their findings suggest that immediate responses are more honest than delayed responses, and that these differences disappear when participants are more familiar with the task due to doing it a second time. It could thus be the case that the relationship between response time and honesty is not linear, but that honesty depends on other factors like the level of cognitive processing capacity that is available. We argue here that manipulating cognitive load is better suited to further this debate. As imposing cognitive load can effectively reduce the available processing capacity, it can distinguish between responses that draw on more or less processing resources.

As some experiments have demonstrated, individuals under cognitive load have a more pronounced tendency to respond in accordance with their automatic, affective intuition. For instance, it leads people to choose chocolate cake over fruit (Shiv & Fedorikhin, 1999). In the moral judgment literature, cognitive load has been found to make people less likely to make an utilitarian judgment (Trémolière, Neys, & Bonnefon, 2012) and respond slower for this kind of controlled cognitive judgment (Greene, Morelli, Lowenberg, Nystrom, & Cohen, 2008). Valdesolo and DeSteno (2008) saw the self-serving bias that is typically observed in the hypocrisy literature disappear when imposing their subjects to high cognitive load; these subjects judged a moral transgression performed by themselves as unfair as when it was performed by another individual, indicating they had no cognitive capacity to make self-serving justifications under cognitive constraint. Similarly, although lying might be a quick response, it could still require some additional cognitive resources. On the basis of this, and on the basis of the four previously mentioned arguments, we predict dishonesty to be reduced under cognitive load.

To measure deceptive behavior we employ the “Die under the cup” paradigm that has been used in similar research settings (Fischbacher & Heusi, 2008; Shalvi et al., 2011). In this paradigm, participants anonymously report the outcome of their die roll for money — where a higher outcome equals higher pay — giving them an incentive to lie. This paradigm does not allow assessment of individual dishonesty, yet the distribution of reported outcomes can be compared to a distribution expected by chance, which would indicate no dishonesty. Conversely, if more high numbers are reported than can be expected by chance, this result indicates dishonesty. For our purposes, a setting wherein participants report their first die roll for payment and roll the die a second and third time for no payment is especially appropriate. Under these circumstances — where desired numbers might be observed on the second and third roll — it is found that people are especially inclined to lie because the lie is justified more easily (Shalvi et al., 2011). To minimize the possibility that participants decide what to report before they even roll the die, we amended this paradigm such that the participants learned which of their three rolls would be paid out only just before reporting them.

In the current experiment, participants thus have the opportunity to serve self-interest by being dishonest in an anonymous setting. During this opportunity, we ask them to perform a concurrent task that imposes either high or low cognitive load. We argue that under high cognitive load the main executive function with which the working memory will be engaged is the concurrent task, thereby leaving less room to process or manipulate information

needed to tell a lie (i.e., the ramifications or the fabrication and justification of the lie, respectively) while at the same time leaving less room for the monitoring and regulation required to do so (i.e., the assimilation of emotions or withholding of factual information, respectively). We therefore expect less dishonesty when under higher cognitive load. Additionally, for those who do have enough cognitive capacity to lie, we expect dishonesty to occur only when self-interest can be served, namely when lying is associated with monetary gain.

## 2 Method

### 2.1 Participants and design

A total of 173 participants (117 females,  $M_{\text{age}} = 21.26$ ,  $SD = 2.61$ ) took part in this experiment. Participants were randomly assigned to either a high cognitive load or a low cognitive load condition. Participants were paid the outcome of their first reported die roll in Euros and received additional money for their performance in other experiments later in the same experimental hour. Sample size was a result of terminating data collection after one week (as was decided beforehand). We report all data exclusions (if any), all manipulations, and all measures in the study.

### 2.2 Materials and procedure

An experimenter showed the participants how to roll a die underneath a cup by shaking the cup back and forth, then told them all to practice rolling the die this way at least three times. Participants were asked to look through a hole in the bottom of the cup each time they rolled the die to see their outcome. They then proceeded individually, using a computer on their desks separated by partition screens, while the experimenter remained outside of the view of the participant in the far front of the room. Participants read that the study was about multitasking and memory, and that they would be asked to memorize a string of letters while rolling a six-sided die three times. An example of a string was given with the same number of letters participants would encounter later in the experiment. Participants were told one of the three rolls — to be randomly assigned by the computer at a later time — would be paid out and that their pay was conditional on their performance on the memory task. Participants in the high cognitive load condition memorized a string of eight letters<sup>1</sup> (i.e., NWR-BRKPJ), and participants in the low cognitive load condition memorized a string of two letters (i.e., KL). In both conditions participants were given ten seconds to memorize their letter string. They were then first instructed to

roll the die three times (the screen auto-advanced after 30 seconds), and subsequently they were asked to report all three outcomes. After this, they were asked to reproduce their letter string. Importantly, just before reporting the outcome of the first roll — but after having rolled the die three times — all participants were told the computer had decided their first roll would be paid out.

Participants then completed three manipulation check questions. First, to ensure that participants in the high load condition were in fact occupied with the letter string, we asked them to indicate how much they agreed with the following statement: *While rolling the die, I was mainly thinking of the string I had to remember* (scale from 1 = *totally disagree* to 5 = *totally agree*). To ensure that any observed differences between the two load conditions would not be due to participants in the high load condition having trouble perceiving the outcome of all three rolls, we asked them whether they agreed with: *I took a good look at all three rolls* (scale from 1 = *totally disagree* to 5 = *totally agree*). To make sure any differences observed between conditions would not be due to participants having trouble remembering their outcomes, we asked participants to indicate: *How many of the rolls did you remember seeing?* (0 = *none*, 1 = *one*, 2 = *two*, 3 = *all three rolls*). Next, participants answered one question pertaining their feelings of entitlement to full payment: *I feel I have the right to earn six Euros* (slider from 0 = *totally disagree* to 100 = *totally agree*). This question enabled us to ensure that observed differences were not due to varying feelings of entitlement to payment.

For exploratory reasons, we then presented participants with emotion items, as being dishonest might cause people to feel negative emotions, especially when they have no means of justifying their behavior (Shalvi et al., 2012), or positive emotions, caused by the thrill of cheating (Ruedy, Moore, Gino, & Schweitzer, 2013).<sup>2</sup> Participants were probed for suspicion, yet none was aware of the aim of the study, and demographics were ascertained.

<sup>1</sup>Letters were chosen instead of numbers (see for the manipulation with numbers Gilbert & Hixon, 1991) to prevent interference with the numbers seen on the die.

<sup>2</sup>Four positive items (e.g., “happy”, “content”;  $\alpha = .87$ ), and sixteen negative items (e.g. “sad”, “tense”;  $\alpha = .93$ ; all scales ranging from 0 = *not at all*, 7 = *very much*) were randomly presented, and one overall mood scale (slider from -50 = “*very bad*”; 50 = “*very good*”). Due to a technical failure, five participants’ answers to the mood questions were not recorded (3 in low load, 2 in high load). Independent-samples t-tests were conducted to compare the mean of the positive emotion items between conditions and the mean of the negative emotion items between conditions. Participants in the low load condition felt more positive emotions ( $M = 4.94$ ,  $SD = 1.00$ ) than the participants in the high load condition ( $M = 4.40$ ,  $SD = 1.24$ ),  $t(166) = 3.10$ ,  $p = .002$ . For the negative emotions, there was a marginally significant difference between the low load condition ( $M = 1.93$ ,  $SD = .83$ ) and the high load condition ( $M = 2.21$ ,  $SD = 1.12$ ),  $t(166) = -1.84$ ,  $p = .07$ . However, there was no difference between overall mood between the low load condition ( $M = 26.13$ ,  $SD = 12.98$ ) and the high load condition ( $M = 22.02$ ,  $SD = 18.34$ ),  $t(166) = 1.67$ ,  $p = .10$ . None of the three mood scales correlated with the reported die rolls in the two conditions, all  $p$ 's > .23.

Table 1: Frequency and corresponding percentage (in parentheses) of the reported outcomes of all three die rolls for both conditions

		Reported outcomes of die roll					
		1	2	3	4	5	6
Roll one	Low load	6 (6.98)	6 (6.98)	10 (11.63)	26 (30.23)	15 (17.44)	23 (26.74)
	High load	13 (14.94)	10 (11.49)	13 (14.94)	22 (25.29)	20 (22.99)	9 (10.34)
Roll two	Low load	13 (15.12)	12 (13.95)	15 (17.44)	17 (19.77)	16 (18.60)	13 (15.12)
	High load	9 (10.34)	14 (16.09)	12 (13.79)	24 (27.59)	11 (12.64)	17 (19.54)
Roll three	Low load	9 (10.47)	15 (17.44)	10 (11.63)	13 (15.12)	19 (22.09)	20 (23.26)
	High load	16 (18.39)	16 (18.39)	7 (8.05)	11 (12.64)	21 (24.14)	16 (18.39)

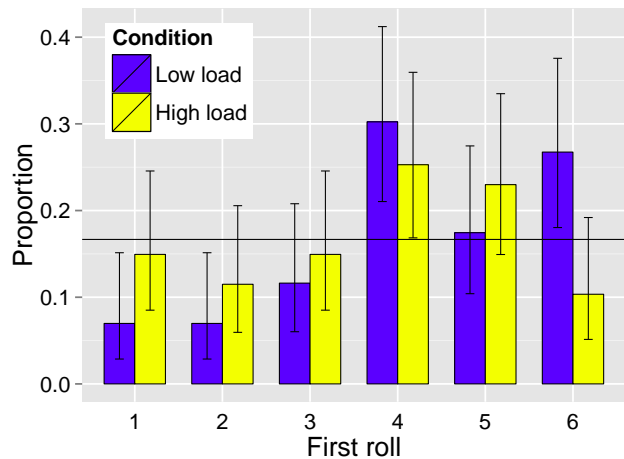
### 3 Results

#### 3.1 Manipulation check

We did separate independent-samples t-test with condition as independent and the manipulation check questions as dependent variables. These analyses indicated that participants in the high load condition were thinking of their string of letters more ( $M = 3.97, SD = 1.60$ ) than participants in the low load condition ( $M = 2.79, SD = 1.50$ ),  $t(171) = -4.97, p < .001$ .<sup>3</sup> There was no difference in how good a look participants had at their three rolls between the high load ( $M = 4.68, SD = 0.69$ ) and the low load condition ( $M = 4.79, SD = 0.49$ ),  $t(154.86) = 1.24, p = .22$ . Almost all participants in both the high load condition ( $M = 2.95, SD = 0.21$ ) and the low load condition ( $M = 2.98, SD = 0.22$ ) remembered seeing all three rolls. This memory did not differ between the conditions,  $t(171) = 0.70, p = .48$ . Participants in the high load condition did not feel significantly more entitled to full pay ( $M = 73.22, SD = 29.28$ ) than participants in the low load condition ( $M = 70.16, SD = 29.05$ ),  $t(171) = -0.69, p = .49$ . These results indicate that our manipulations worked as intended. Additionally, the time participants took to submit the page on which they reported the outcome of their first die roll did not differ between the low load condition ( $M = 7.41, SD = 3.81$ ) and the high load condition ( $M = 7.23, SD = 4.31$ ),  $t(171) = 0.28, p = .78$ .

<sup>3</sup>Although all participants in the low load condition remembered their letter string correctly, only 58.6 % of participants in the high load condition were able to remember their eight letters correctly and in the right order, indicating this task was indeed cognitively taxing. 37.9 % got 6 or more letters correct, but the letters were not in correct order. 3.4 % got 5 or less letters correct. Distributions of the three reported outcomes of these participants that did not get the letter string correct in the high load were not significantly different from uniform, all  $ps > .38$ , meaning their results did not deviate from our main findings.

Figure 1: Proportion of the reported outcome of the first die roll by cognitive load. Bars represent the proportion of participants who reported having outcome one through six on the roll that determined pay, for low (blue) and high (yellow) cognitive load conditions. The horizontal line represents the proportion of each of the outcomes of a fair die roll according to chance (.16667 for each outcome). Error bars represent 95% confidence interval of the proportion.



#### 3.2 Distribution of reported outcomes

Table 1 shows the frequencies of reported outcomes for each possible outcome of a six-sided die. We tested whether the reported outcomes in both conditions differed from a uniform distribution with a chi-square test in order to examine whether the reported rolls resemble a distribution that can be expected by chance (i.e., a fair distribution). In the high load condition, the distribution of the first die roll — the roll that was going to be paid out — was almost significantly different from a uniform distribution, due to a tendency for the number 4 to be over-reported,  $\chi^2(5, N = 87) = 9.76, p = .08$ . The second roll did

not differ significantly from a uniform distribution either,  $\chi^2(5, N = 87) = 10.03, p = .07$  (if anything, this small effect was also caused by four being the most reported roll, see Table 1), nor did the third roll,  $\chi^2(5, N = 87) = 8.10, p = .15$ . In the low load condition, however, the reported outcomes for the first die roll did differ from a uniform distribution,  $\chi^2(5, N = 86) = 25.77, p < .001$ , indicating dishonest reporting of the to be paid out roll (see Figure 1). The second and third rolls did not differ significantly from a uniform distribution in the low load condition,  $\chi^2(5, N = 86) = 1.35, p = .93$  and  $\chi^2(5, N = 86) = 7.21, p = .21$  respectively.

Importantly, the average reported outcome of the first roll of the die was higher in the low load condition ( $M = 4.24, SD = 1.49$ ) than the high load condition ( $M = 3.60, SD = 1.57$ ), Mann-Whitney  $Z = -2.61, p = .009$ , indicating that participants in the low load condition lied to get a higher pay. As hypothesized, for the second roll, the outcome in the low load ( $M = 3.58, SD = 1.66$ ) and the high load ( $M = 3.75, SD = 1.61$ ), did not differ, Mann-Whitney  $Z = -0.63, p = .53$ . Similarly, the outcome of the third roll did not differ between the low load ( $M = 3.91, SD = 1.71$ ) and the high load ( $M = 3.61, SD = 1.81$ ), Mann-Whitney  $Z = -1.01, p = .27$ .

## 4 Discussion

The current study tested whether having limited cognitive capacity impairs one's ability to lie. We found considerable lying when cognitive capacity was not limited, but no detectable lying when cognitive capacity was limited. This pattern of deception — lying when cognitive processing was possible and being honest when it was not — was observed only for the outcome of the die roll that had financial consequences. This suggests that when enough cognitive capacity is available *and* people can serve self-interest by being dishonest, they will often do so. Yet without this cognitive capacity, people are honest regardless of the fact that self-interest could have been served.

In anonymous situations, not unlike the one we created in the current experiment, cognitive control might be needed to override self-serving biases. We argue, however, that a certain amount of cognitive processing might also already be in place to shape the bias itself. Comparing our results with findings by Valdesolo and Desteno (2008), it could be argued that, in both studies, imposing cognitive load led to a diminished capacity to serve the self. In other words, although people have an automatic tendency to be self-serving, this automatic reaction requires some mental processing still. A parallel can be drawn with research on stereotyping, where cognitive load is found to make the activation of a stereotype less likely to occur; yet when the stereotype is already activated, cognitive load increases its

usage (Gilbert & Hixon, 1991). These findings suggest that, although the activation of a stereotype is fairly automatic, to be able to activate the information some cognitive resources are still required.

Our findings are in line with several other lines of research that invoke a dual-process framework. For instance, activating an intuitive mindset, in contrast to deliberative mindset, can lead people to deceive less (Zhong, 2011). Likewise, in a recent paper, it was argued that people are intuitively cooperative, for those who decide quickly (either by instruction or on their own) and those who are induced to rely on their intuition, contribute and cooperate more in economic games (Rand, Greene, & Nowak, 2012, but see Tinghög et al., 2013, for a different perspective on the time pressure data). Next to this, people who have a generally preferred thinking style of relying on their intuition may be more inclined to show sharing behavior and altruistic punishment (Kinunnen & Windmann, 2013). Another corresponding notion is that working memory is indirectly related to dishonesty through the ability to be creative in finding justifications for this dishonesty, as working memory relates positively with creative performance (De Dreu, Nijstad, Baas, Wolsink, & Roskes, 2012) and creative people have been found to cheat more (Gino & Ariely, 2012).

Contrary to our findings however, a recent experiment utilizing a variation of the paradigm used in the current study observed more dishonesty under time pressure (Shalvi et al., 2012). This contradiction is surprising, because time pressure and cognitive load have often been used interchangeably, namely to lay bare an automatic process. One possible reason for these deviating findings could be that our procedure was adjusted such that participants' opportunity to justify any lies beforehand was kept to a minimum. Namely, only after rolling the die three times were participants in the current study informed about which of their die rolls would earn them money. In the procedure utilized by Shalvi and colleagues (2012) participants knew that the one roll they were going to report was for money even before being under time pressure. Similar to the argument made by Shalvi and colleagues (2012), others have found that being forced to contemplate for 3 minutes about the decision to lie decreased deception, as compared to an immediate choice that had to be made within 30 seconds (Gunia et al., 2012). What remains unclear however, is whether in these cases the immediacy with which the decision had to be made was pressing enough to stop any justification or rationalization, which arguably could have already taken place while apprehending the nature of the task.

Another difference between our cognitive load manipulation and the aforementioned time pressure manipulation is that our participants had two concurrent demands on cognitive capacity instead of having one task demanding immediate capacity. This difference could have led

participants under time pressure — contrary to those under cognitive load — to have just enough cognitive capacity to generate an untruthful response. In that case, even though time pressure will make observing the product of automatic processing more likely because further processing (i.e., deliberation) is not possible, some processes like self-serving biases or relying on heuristics might still occur under time pressure. These processes may happen extraordinary fast and mostly outside of conscious awareness and can therefore arguably be considered part of the automatic response. As Balci et al. (2006) showed, people readily see what they are motivated to see. People may be unaware of self-serving biases because these biases operate outside of conscious awareness. The possibility that under time-pressure self-serving biases are present but under cognitive load they are not is currently insufficiently founded. It does, however, open up an opportunity for further research to explore what processes make up the automatic part of the dual system. As has been argued before, both systems involve cognition in the sense of information processing (Cushman, 2013). The question, then, is not what the automatic tendency is during (dis-)honesty junctures, as both lying and being honest can be automatic, but what processes contribute to the automaticity of the given tendencies.

Although a body of research presumes lying is a deliberate act, an indication that a process takes up cognitive capacity — such as found here — does not necessarily entail that this process is not also somewhat automatic. The process of reporting the truth might just be one that is relatively less prone to interference by simultaneous demand on cognitive capacity than the self-serving bias that so often comes on top of it. The current study therefore calls for further empirical clarification on the different effects of manipulations such as time pressure and cognitive load, but also on their differences with for example depletion of self-control resources. This manipulation is known to increase cheating (e.g., Mead, Baumeister, Gino, Schweitzer, & Ariely, 2009), a result possibly due to not having enough executive resources to identify an act as moral or immoral (Gino, Schweitzer, Mead, & Ariely, 2011). However, studies that did not focus on cheating but instead focused on lying found lying was not affected by depletion (Debey, Verschuere, & Crombez, 2012). In light of the abovementioned findings, it thus seems that although serving self-interest is usually fairly easy, lying is not.

## 5 Conclusion

To understand unethical behavior, we need to study the prerequisites for such dishonest behavior to take place. The current study suggests that one of those prerequisites

is having ample cognitive capacity. On the societal level, a moral basis that pulls people's behavior away from pure self-interest is indispensable. Although individuals are often found to act in their own interest, and lying is often done out of self-interest, solely on the basis of this it would be unwise to conclude that being deceptive is the default: The current study shows that sometimes telling the truth is the easiest option in terms of cognitive processing and that telling a lie takes at least some additional mental effort.

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