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Color me honest! Time pressure and (dis)honest behavior

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We introduce three modifications to the die-in-a-cup paradigm to gain novel insights into dishonest behavior under time pressure. The regular die is substituted with a custom one that has a distinct color on each side as a way of manipulating familiarity with the decision situation. The cup is substituted with a 'dice tower' to control the randomization process. Alongside outcome data, we capture mouse cursor trajectories. Results from our preregistered laboratory experiment involving 229 subjects suggest that time pressure increases dishonesty only when the regular die is used. Mouse tracking analysis suggests that it takes more effort to be honest than to lie outright and that partial lying is most difficult.

KEYWORDS

die-in-a-cup, lying, time pressure, rehearsed lies, mouse tracking

1 Introduction

Understanding how design choices in an environment can influence our behavior is crucial for promoting honesty and integrity. We can create a society that values these principles by identifying features encouraging truth and transparency. Acknowledging mixed findings in the existing literature, this paper aims to identify mechanisms that support truth-telling behavior.

"Die-in-a-cup" (Fischbacher and Föllmi-Heusi, 2013) is a popular decision paradigm in research on lying. Participants privately observe the outcome of a random event, report their observation, and are subsequently given a monetary reward based on their report. Although the truthfulness of individual reports cannot be evaluated, collective reports of a given participant group can be (Foerster et al., 2013; Hilbig and Hessler, 2013; Schindler and Pfattheicher, 2017).

Numerous studies have revealed a consistent dishonesty bias (Mazar et al., 2008; Fischbacher and Föllmi-Heusi, 2013; Gneezy et al., 2018) even though, generally, the participants are observed to lie only minimally (Abeler et al., 2019). Some interpret these findings as indicative of dishonesty being an instinctive response when provided with an incentive to lie (Bereby-Meyer et al., 2018; Köbis et al., 2019). In an attempt to scrutinize them, manipulation of the decision-making process, typically via cognitive load or time pressure, is often used.

Cognitive load has been consistently demonstrated to encourage truth-telling (Shalvi et al., 2012; Van't Veer et al., 2014; Bereby-Meyer et al., 2018; Reis et al., 2023). In contrast, the effect of time pressure remains disputed. Some studies observe honesty increase under time constraints (Capraro, 2017; Lohse et al., 2018; Capraro et al., 2019; Van der Cruyssen et al., 2020), while others report to the contrary (Shalvi et al., 2012). Foerster et al. (2013), however, argues that the participants in Shalvi et al. (2012) can have fabricated a lie before experiencing time pressure.

Brain research has shown that practice improves the efficiency of knowledge retrieval and response inhibition across various task domains (Pirolli and Anderson, 1985; MacLeod and Dunbar, 1988; Milham et al., 2003; Olesen et al., 2004; Walczyk et al., 2009; Brehmer et al., 2012; Hu et al., 2012). In particular, rehearsed lies are associated with less conflict than spontaneous lies, as evidenced by lower relative activity in the anterior cingulate cortex (Ganis et al., 2003).

As far as documented behavioral effects, rehearsed lies are associated with lower reaction times than spontaneous lies (DePaulo et al., 2003; Johnson et al., 2008; Walczyk et al., 2009). Ganis et al. (2003) could not even detect a difference in response times between rehearsed lies and truthful answers. It is also noteworthy that, in fact, very little practice is required to alter the cognitive cost of lying (Van Bockstaele et al., 2012) and the effect carries over across various decision tasks (Hu et al., 2012; Van Bockstaele et al., 2012). In an attempt to alleviate the issue, Foerster et al. (2013) compares individual die rolls to series of rolls with short breaks in-between. Yet, we have an even deeper concern with the whole paradigm.

The conventional six-sided die with pips, where higher values are typically associated with higher payoffs, makes it rather easy for participants to misreport voluntarily or even involuntarily. In a typical experimental setting, one need not look at the die or even roll it to know what to report in order to maximize the payoff.

Our experimental design introduces three important changes to the basic die-in-a-cup paradigm. Most notably, we substitute the regular die with one that has a distinct color on each side ("color die"). Alongside time pressure, this constitutes a separate treatment condition that substantiates a meaningful state of the world for the participants to report. In addition, without prior knowledge of the color to payoff associations, there is no readily available report for the participants to fall back on.

Secondly, we substitute the cup with what is known as a dice tower in tabletop gaming. The latter is a significant improvement as it enables control over the quality and duration of the randomization phase. With the cup, both are at the discretion of the participant, who can cheat by shaking the cup inadequately or nullify time pressure by taking an excessive amount of time to do that. Stable timing is especially crucial in our experimental setup as decision making processes only range from milliseconds to a few seconds, varying with the decision complexity and context (Nieuwenhuis et al., 2005; Ratcliff and McKoon, 2008). Furthermore, human perception of short intervals, like 1 to 3 s the time it takes to shake the cup, can be highly subjective (Grondin, 2010). With the dice tower, one only needs to tip the die over the ledge, which ensures proper randomization and stable timings across the participants.

Lastly, our participants have to submit their reports by choosing which button to click instead of typing a number. While doing so, mouse movement trajectories are tracked. Indeed, mouse tracking is a popular method for studying the dynamics of cognitive processes in different domains (Zgonnikov et al., 2017; Maldonado et al., 2019, see for an overview). In our experiment, the six buttons occupy most of the screen real estate and are arranged in a radially symmetrical pattern, with the mouse cursor always positioned in the center. This enables us to examine not only outcome data but also the dynamics of the decision-making.

2 Theoretical background

This section delineates the theoretical underpinnings that guide our experimental inquiry, linking key conceptual frameworks to our design choices.

The *dual process theory* (DPT) delineates two cognitive systems: System 1, characterized by intuitive and automatic processing; and System 2, which is slower and more deliberate (Kahneman, 2013). This theory is particularly relevant to the "die-in-a-cup" paradigm, where participants' decisions to report truthfully or deceitfully can be seen as a battle between these two systems. Our experimental manipulations, such as the introduction of the color die and time pressure, are designed to probe the interplay between these systems. For instance, the unfamiliarity of the color die may trigger more System 2 engagement, as participants cannot rely solely on intuitive responses.

The Social Heuristic Hypothesis (SHH) extends DPT by suggesting that behaviors beneficial in frequent social interactions become internalized as intuitive responses (Rand et al., 2014, 2015). This theory would predict that participants facing the color die, an unfamiliar stimulus, might shift from their habitual response patterns.

Both the *diffusion decision model* (DDM) (Ratcliff and McKoon, 2008) and *decision field theory* (DFT) (Busemeyer and Townsend, 1993) view decision-making as a process of accumulating evidence until a decision boundary or a sufficient evidence threshold is reached. In the context of our experiment, this theoretical perspective would predict that with the regular die, participants might reach decision boundaries quicker due to familiarity. In contrast, the novel color die would be predicted to require more evidence accumulation.

All of these theories emphasize the dichotomy between fast, intuitive and often heuristic responses and slow, considerate and rational deliberation. Fast responses are generally ingrained through frequent practice in typical settings while slow responses necessitate conscious deliberation and can override intuitive responses (Kahneman, 2013). In the following, we explore how practice influences the nature of deceptive responses. This theoretical groundwork sets the stage for introducing an experimental manipulation involving regular and color dice.

The *activation decision construction model* (ADCM) posits that deception typically demands greater cognitive resources than truth-telling, resulting in an increased cognitive load and response times (Walczyk et al., 2003). However, ADCM also recognizes that this cognitive load can be mitigated through rehearsal. Preparing deceptive responses in advance allows for retrieval from long-term memory, streamlining the response process. This rehearsal makes responses more automatic and rapid, akin to well-practiced truthful responses (Pirolli and Anderson, 1985). Conversely, inhibiting a rehearsed response to generate a novel one can significantly increase cognitive load and response times (Schneider and Chein, 2003; Barrett et al., 2004). In our context, ADCM would predict that rehearsed lies reduce cognitive load, and would predict quicker responses and lower conflict to be observed with familiar stimuli (regular die) vs. the novel (color die).

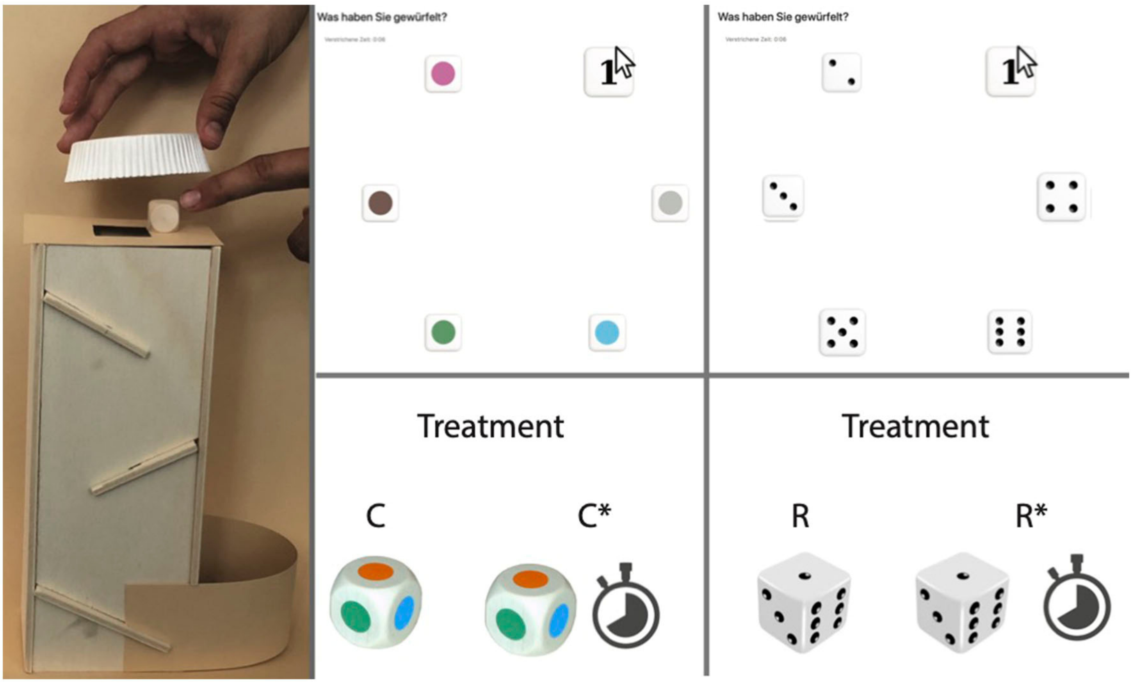

FIGURE 1
Dice tower used as a randomization device in the experiment. Participant decision screens in treatments *C*/*C** and *R*/*R**, respectively. Treatment structure overview.

3 Experiment design and methods

3.1 Experimental setup

The experiment, visualized in Figure 1, is comprised of four stages. Stages 1, 3, and 4 are conducted with the help of computer terminals. Stage 2 (rolling the die) is conducted without but synchronized across the participants who are divided into four treatment conditions: R, R^*, C, C^*.

Each subject only completes one die rolling task and the design is between-subject.

Before each session, the requisite die[1] is placed on top of the dice tower and covered with an opaque paper lid in order to rule out priming.

In stage 1, the participants receive the general instructions on paper and treatment-specific instructions on the computer screen. When everyone is ready, stage 2 begins where the participants are prompted to remove the lid and tip the die over the ledge of the dice tower following a five-second countdown.

In stage 3, the participants are presented with six buttons arranged in a radially symmetrical pattern occupying most of the screen real estate. The mouse cursor is positioned in the center of the pattern. Depending on the treatment condition, each button corresponds to one of the six colors or one of the six faces of a regular die with pips.[2] The associated payoff is shown only when the mouse cursor hovers over the button. The participants submit their reports by clicking any of the six buttons. Their mouse cursor trajectories get recorded in the process.

Borrowing from Dana et al. (2007), we do not provide the participants in time pressure conditions with an exact time limit but instead with an interval between 6 and 12 seconds. This particular range is based on a pilot session and allows one to explore multiple options even under the strictest conditions of facing the color die and time pressure.

In stage 4, the participants are asked to provide answers to three blocks of questions. First, we perform a number of checks (where applicable) by asking if they can clearly distinguish between all the colors used in the experiment, if they have a favorite color, if they can recall the payoff associated with the color they reported (incentivized), if they felt time pressure, and if they felt some general pressure during the course of the experiment. The second block contains three problems of the Cognitive Reflection Test (CRT) (Frederick, 2005) as a crude measure of cognitive ability (Table S4). In the final block, the participants are asked to fill out a basic demographic questionnaire as well as to report on their prior experience with laboratory experiments and games involving dice.

The experiment was programmed and conducted using oTree (Chen et al., 2016); The recruitment was done via ORSEE (Greiner, 2015). The data analysis was performed in R.

3.2 Participant motivation for exploring multiple options

We elicited the participants' motivations for exploring multiple options in the decision stage (from those that reported having

1 Color: green on top, gray facing the participant; regular: one on top, two facing the participant.

2 Particular arrangement randomized across the participants.

checked more than one). These motivations were manually and independently categorized by the two authors. The interrater agreement, assessed using Cohen's Kappa ($\kappa = 0.7$), indicates substantial agreement (Landis and Koch, 1977). Additionally, a highly significant p-value (p-value $= 0.000$) underscores the reliability of this agreement.

Disagreed upon statements were discussed and resolved individually. Two themes were identified: "curiosity" and "payoff maximization". Ambiguous statements were labeled as "other".

3.3 Ordered logit regression of reported die roll

We use Bayesian inference with uninformative priors to fit the reported die roll data to an ordered logit model. The estimated specification includes dummy variables for the color die, time pressure and the interaction between the two. We also use an AIC-based step-wise algorithm to determine the necessary set of control variables. We collect 10,000 K samples (adaptation: 10K, burn-in: 100K) from each of the two chains.

4 Results

In a preregistered[3] laboratory experiment, we collected a total of 229 observations [between 55 and 58 in each condition, excluding color-blind participants ($n = 3$) and those who failed to report in time in the time pressure conditions (n=3)]. The data sample contains 61% females, 23% business administration and economics students. The average age is 24.4 years (SD = 7.7, Table S1). Informed consent was obtained from all participants. The study was approved under the block approval of the MPI Bonn Decision Lab and was in line with the laboratory rules of the University of Jena.[4]

A manipulation check confirms that R^* and C^* participants reported significantly higher levels of perceived pressure than their counterparts in conditions R and C (Table S2).

4.1 Time pressure effect depends on the die

We never observe an average die roll report below the "honesty reference" of 3.5 (Figure 2A). In particular, there is evidence of dishonest behavior in conditions C ($t = 2.9$, $p = 0.005$[5]) and R^* ($t = 2.6$, $p = 0.013$).

3 https://doi.org/10.1257/rct.3115-2.1

4 The preregistration states that 200 subjects will be collected (the paper includes 229), and that treatment arms will be evenly balanced between males and females, but slightly more females than males participated (61% female).

5 All reported p-values are from two-tailed tests unless mentioned otherwise.

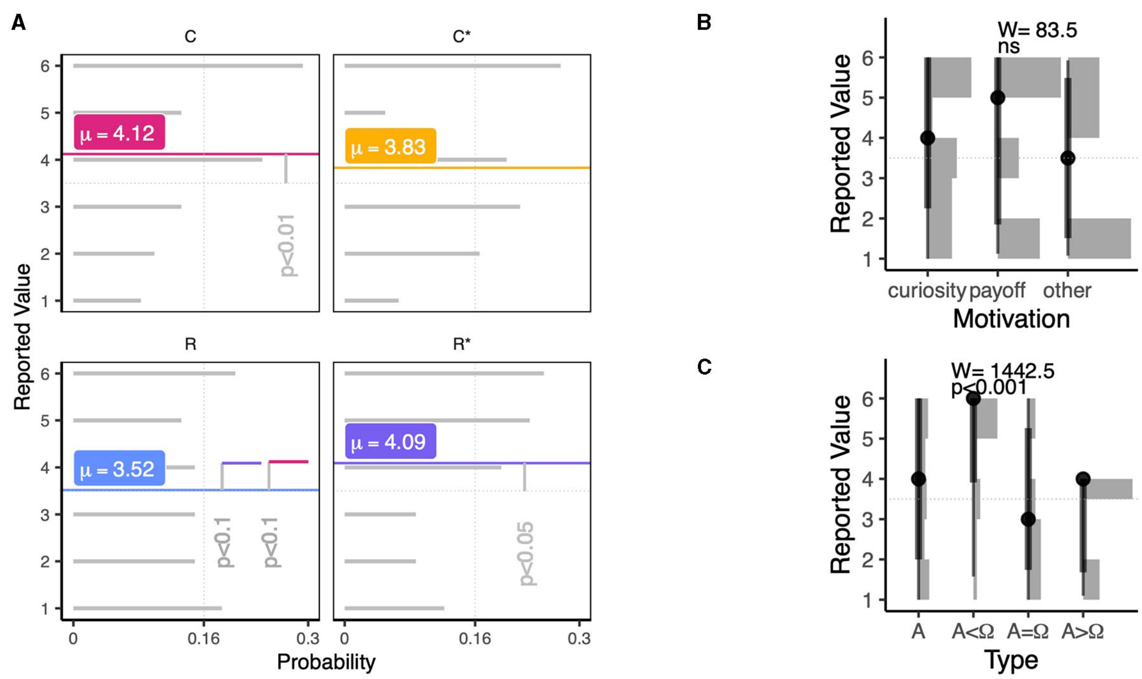

FIGURE 2
The dotted horizontal gray line represents the complete honesty benchmark. **(A)** The empirical distribution of reported rolls by treatment condition. The observed average is depicted as a colored horizontal line. The dotted vertical gray line represents the uniform distribution benchmark. The p-values indicate the results of statistical tests of different null hypotheses as indicated by the solid vertical gray lines. **(B)** Self-reported participant motivations for not exploring multiple options. **(C)** displays the reported roll by trajectory type. Trajectory types are defined based on their starting (*A*) and end (Ω) point.

TABLE 1 Self-reported motivations and trajectory types by treatment.

	C	C*	R	R*	Total
Self-reported motivation					
Curiosity	15	8	2	1	26
Payoff	1	1	3	1	6
Other	2	0	1	1	4
Total					36
Trajectory type					
A	35	46	49	47	177
$A < \Omega$	8	6	5	5	24
$A = \Omega$	15	6	1	1	23
$A > \Omega$	0	0	3	2	5
Total					229

The participants were asked to report if they had explored more than one option. Additionally, their mouse cursor trajectories were analyzed to determine the actual number of options explored. In trajectory tracking, A denotes the first and Ω denotes the last option explored.

In line with our conjecture outlined in the introduction, we find the effect of time pressure to depend on the type of the die used. There is more dishonesty under time pressure with the regular die ($t = 1.9$, $p = 0.062$) but no such effect can be found with the color die. Also note that without any time pressure, the use of the color die results in higher reports ($t = -1.7$, $p = 0.085$).

These findings are corroborated by an ordered logit regression estimated using Bayesian inference (Table S5).

4.2 Color die evokes curiosity

As part of the experimental procedure, we elicited individual motivations behind exploring multiple options. Overall, 36 participants stated to have checked more than one option (Table 1) and provided a motivation for doing so. The two authors independently classified these self-reports as either "curiosity", "payoff maximization", or "other" (Cohen's $\kappa = 0.7$, $p = 0.000$). Furthermore, a binomial test shows that participants are unlikely to have reported their favorite color (Table S3).

There is a significantly higher proportion of participants motivated by "curiosity" in conditions C/C^* than in R/R^* ($\chi^2 = 6.6$, $p = 0.009$), which explains the observed difference in the effect time pressure has on the reported die rolls. However, there is no significant effect of time pressure on the distribution of motivations for a given die type. It is important to approach the robustness of these findings with a degree of caution. The sample sizes are unbalanced, with a considerably larger group of 36 participants in the C/C^* conditions, contrasted with a smaller group of just 9 participants in the R/R^* conditions.

However, self-proclaimed payoff maximizers do not report significantly higher values compared to the complete honesty benchmark (Figure 2B).

As a final consideration, it is crucial to acknowledge the inherent limitations associated with self-reports, as such data can be subject to biases. Consequently, while these self-reports provide valuable insights, they are employed primarily as a supplementary interpretative tool.

4.3 Mouse cursor trajectories reveal distinct behavioral types

During the decision stage in the experiment we tracked the individual mouse cursor trajectories.

This allows us to classify the participants into four distinct behavioral types based on the initially explored option (A) and ultimately reported roll (Ω). The subsequent analysis presupposes that the initially explored option is the one to have been actually rolled. To test this assumption we inspect the first option visited. A χ^2-test confirms that the outcomes are uniformly distirbuted ($\chi^2 = 4.3$, df = 5, p-value = 0.512).

Type A reports the only option explored and thus can be interpreted as honest. Type $A = \Omega$ explores multiple options but reports the initial one and so, too, can be interpreted as honest. Type $A > \Omega$ explores multiple options and reports a lower roll than the initial one. It is not clear how to interpret this type—they could, e.g., be confused or prefer to "appear honest" even at a cost. Finally, type $A < \Omega$ explores multiple options and reports a higher roll than the initial one. Their average reported roll is significantly higher than that of the other types ($W = 1442.5$, $p = 0.000$, Figure 2C) and we interpret such behavior as dishonest.

If we contrast the behavioral types with the aforementioned self-reported motivations (Table 2), we can see that types $A \leq \Omega$ are represented mostly by participants motivated by "curiosity" whereas type A is dominated by those motivated by "payoff maximization" (Fisher's exact test, simulated $p = 0.000$).

One can also compare our behavioral types to the classification in Fischbacher and Föllmi-Heusi (2013) who use the categories of "honest", "income maximizers" and "partial liars" to describe their participants. Following their identification strategy, our types A and $A = \Omega$ would correspond to "honest", $A < \Omega$ participants with reports lower than 6 would correspond to "partial liars" and $A < \Omega$ participants reporting 6 would correspond to "income maximizers" (see Equation A.E).

The two classification outcomes are compared in Table 3. Note that Fischbacher and Föllmi-Heusi (2013) estimates are upper bounds based on the assumption of uniformly distributed reports. Our estimates suggest that the share of honest participants is considerably higher than reported before.

4.4 Mouse cursor trajectories provide insights into the dynamics of the decision process

Having access to the mouse movement data allows us to analyze their actual time dynamics. First and foremost, we analyze initiation time, defined as idle time before the first onset of movement, which is considered to be a signal of response conflict.

We find significant differences between the treatments. The average initiation time in C is higher than in C^* ($W = 1048.5$, $p = 0.001$). However, there is no difference between R and R^*. On the other hand, the average initiation time in R^* is higher than in C^* ($W = 1249$, $p = 0.047$). This implies that reporting the die roll was easiest in C^* and most difficult in C (Figure 3A).

We also note a number of interesting findings across all four treatments. Reporting a roll of 4 is associated with the highest

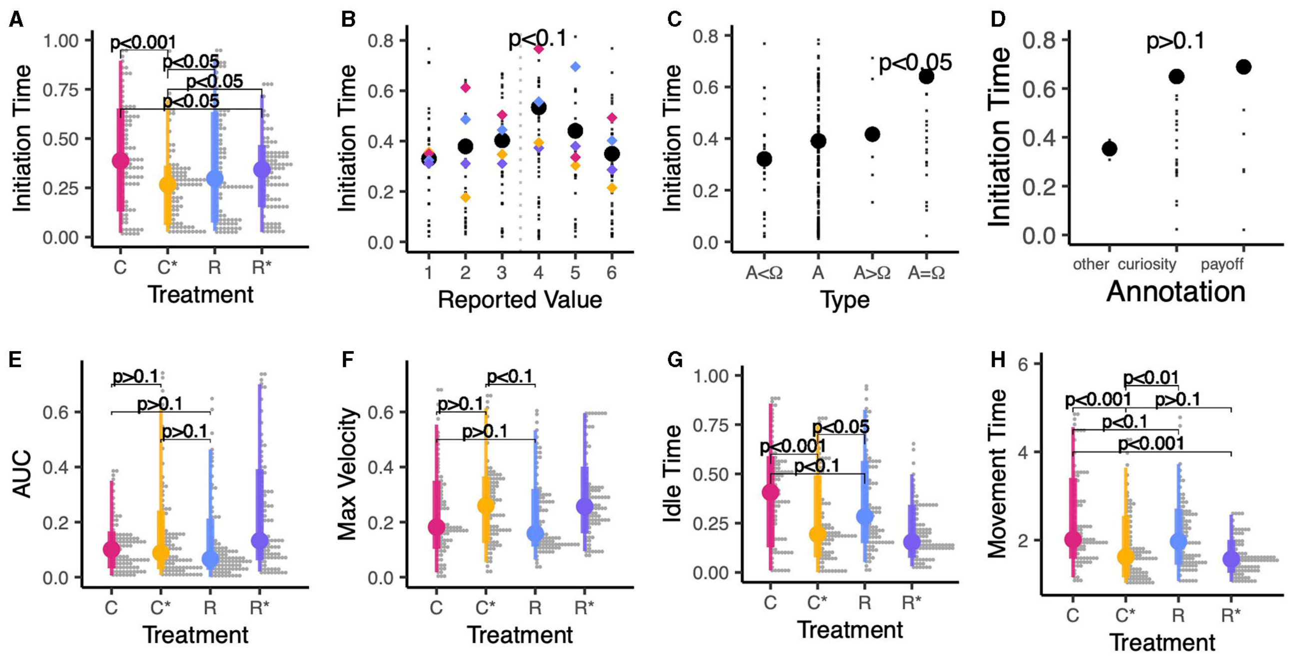

FIGURE 3
(A–D) Initiation time is defined as the time until the onset of the first mouse movement. **(A)** Initiation time by treatment condition. The colored dots represent the observed averages, the box represents the interquartile range, the whiskers represent the minimum and maximum values within 1.5 IQR. **(B)** Average initiation time by reported value. The black dots indicate the average by value, the colored diamonds represent treatment averages with the associations described in **(A)**, the small dots represent individual initiation times. The p-value corresponds to a Wilcoxon test comparing the initiation time of reporting four against all other reports. **(C)** Average initiation time by trajectory type. The **p**-value correponds to a Wilcoxon test comparing the initiation time of the A=Ω type against all other mouse trajectory types. **(D)** Average initiation time by self-reported motivation not to explote multiple options. The p-value corresponds to a Wilcoxon test comparing the initiation time of payoff maximizers against all other motivations. **(E–H)** By treatment condition: area under the curve (AUC), maximum velocity, idle time, and movement time, respectively. Colored dots indicate treatment means.

initiation time relative to all other reports combined ($W = 3605$, $p = 0.066$, Figure 3B). This can be interpreted as partial lying requiring more effort that truth telling and lying fully.

Between the two motivations to explore reported by the participants, "curiosity" is not associated with a different initiation time relative to "payoff maximization" ($W = 1095$, $p = 0.235$, Figure 3D).

The $A = \Omega$ type exhibits the highest initiation time relative to all other types combined ($W = 1821.5$, $p = 0.035$, Figure 3C). On the other hand, the $A < \Omega$ type is not statistically different from the rest ($W = 2757.5$, $p = 0.834$). The pattern implies that it takes more effort to be honest, and it may as well have turned out to be the other way around.

Finally, we explore other popular mouse movement metrics as potential ways of explaining the differential effects time pressure has on the reported rolls as a function of the die type.

The average area under the curve (AUC) is significantly larger in R^* than in R ($W = 695$, $p = 0.000$, Figure 3E), which indicates a greater level of response conflict in the decision-making process.

The R^* participants also display a significantly higher peak velocity than the R participants ($W = 822$, $p = 0.011$, Figure 3F), which is associated with a higher level of commitment, vigor and impulsiveness for action (Yamauchi et al., 2019).

At the same time, the former exhibit a significantly lower overall mouse movement time ($W = 1613$, $p = 0.000$, Figure 3H) without any difference in idle time (Figure 3G).

TABLE 2 Motivation by behavioral type.

	A	A< Ω	A= Ω	A> Ω
Curiosity	1	7	18	0
Payoff	2	3	0	1
Other	1	1	2	0

We do not find significant differences in the metrics discplayed in Figures 3E–H if the color die is used instead.

5 Discussion

Our main finding is that the effect of time pressure on the reported die roll depends on the type of the die. With the regular die, the participants exhibit more dishonest behavior under time pressure, which is in line with (Shalvi et al., 2012) but contradicts (Suchotzki et al., 2017; Van der Cruyssen et al., 2020). With the color die, there is no effect. If anything, this implies that the effect of time pressure is considerably less generalizable than existing literature would suggest.

The aforementioned difference is likely to be due to the degree of familiarity with the decision situation, which is also reflected in the participants' self-reports. An overwhelming majority appears

TABLE 3 Participant types (percentage points) as identified by rules of probability or mouse trajectories.

	Honest	Partial liar	Income max
C	33	38	39
C*	47	26	38
R	50	29	32
R*	31	44	36
	A or $A = \Omega$	$A < \Omega < 6$	$A < \Omega = 6$
C	86	3	10
C*	90	5	5
R	86	3	3
R*	87	4	5

According to Fischbacher and Föllmi-Heusi (2013) (**Top**), honest participants are individuals reporting 1, 2, or 3, while income-maximizing participants are those reporting 6, exceeding the threshold of 1/6. Partial liars are participants reporting 4 or 5, exceeding the threshold of 1/6. Alternatively (**Bottom**), we define type A and $A = \Omega$ participants as honest, $A < \Omega$ participants reporting 6 as income maximizers, and other $A < \Omega$ participants as partial liars.

to be motivated by "curiosity" rather than payoff maximization when facing the unfamiliar color die. This is corroborated by the recorded mouse cursor trajectories, which reveal that a considerable fraction of participants contemplates multiple options but ends up reporting their first pick with the color die. We also estimate a substantially higher fraction of honest individuals than what (Fischbacher and Föllmi-Heusi, 2013) would suggest.

An alternative interpretation of these findings might center on the concept of guilt associated with dishonesty. It is possible that individuals feel less guilty when they report a different color, as opposed to a different number. This could be due to the perception that altering a number constitutes a more overt act of dishonesty. This tendency appears to persist irrespective of time pressure, suggesting that individuals experience a lower moral burden when lying about a color rather than a number. This observation aligns with previous results showing that the use of the color die tends to elicit higher reports of both types under varying time constraints.

The same mouse tracking data provide a number of insights into the actual dynamics of the decision process. Generally speaking, initiation times indicate that it takes more effort to be honest than to lie outright. Yet, partial lying appears to be most difficult.

When facing the regular die, the participants under time pressure have the same initiation times but longer total trajectories and higher maximum velocities. This suggests an interesting dynamic pattern with more cognitive uncertainty at an early stage but greater commitment and vigor once the decision has been made.

With the color die and time pressure, the participants have the lowest initiation times of all the treatment conditions. Without time pressure, they have the highest initiation times. This indicates that the participants experienced the lowest degree of response conflict in the former (since they cannot be distracted by the familiar die face with six pips) and the highest degree in the latter treatment condition (due to the novelty of the situation and the need to explore). In line with the existing literature, we interpret initiation time as a signal of response conflict (Dale et al., 2008; Freeman and Ambady, 2010; Faulkenberry et al., 2015; Schoemann et al., 2021; Ye and Damian, 2023). However, it is important to consider alternative explanations for these findings. In our controlled laboratory setting, external distractions were minimal, reducing the likelihood that initiation times were influenced by off-task distractions. Nonetheless, other factors could still be at play. Decreased initiation time could also be interpreted as an outcome of heightened task focus, where participants prioritize compliance with instructions. The rapid motor response in this scenario might be less about conflict resolution and more about a focused effort to meet task demands.

Plausible explanations for the lack of time pressure effect with the color die can be given by both the decision field theory and the diffusion decision model. These frameworks posit that individuals may adopt more thorough decision-making processes in unfamiliar situations in order to accumulate information until a clear choice emerges. This is in line with our observations of higher initiation times and contemplative behavior without time pressure in the color die treatment condition.

More generally speaking, the activation decision construction model suggests that the cognitive load associated with honesty may be more significant than previously thought, challenging the notion that deception is inherently more cognitively demanding.

Finally, the social heuristics hypothesis postulates that behavioral responses are shaped by habitual experiences and heuristics viable in familiar settings. Our findings indicate that in unfamiliar situations, individuals may bypass such experiences and heuristics and instead engage in more conscious and deliberate decision-making processes.

Data availability statement

The original contributions presented in the study are included in the article/Supplementary material, further inquiries can be directed to the corresponding author. The code and data can also be accessed at: https://github.com/carinahausladen/color-me-honest.

Ethics statement

The studies involving humans were conducted in accordance with the rules and regulations of the Economics Laboratory of the Friedrich Schiller University Jena as well as approved by Ethics Council of the Max Planck Society. The participants provided their written informed consent to participate in this study.

Author contributions

CH: Conceptualization, Data curation, Formal analysis, Funding acquisition, Investigation, Methodology, Project administration, Resources, Software, Validation, Visualization, Writing – original draft, Writing – review & editing. ON: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Project administration, Resources, Software, Supervision, Validation, Visualization, Writing – original draft, Writing – review & editing.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Supplementary material

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/frbhe.2023.1337312/full#supplementary-material

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