The Impact of Response Time on Deceptive Communication

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Abstract

The inclusion of response time indicators has become a common feature in the contemporary landscape of social media sites. What private information does the response time carry when there is a conflict of interest, and do people use it to improve their welfare? We portray a model and design a modified cheap talk game to study the intricate interplay between response time, private information, and its influence on users' well-being, tailored to situations where truth discovery is time consuming. Our investigation uncovers a noteworthy sender hope to not have to lie to get what she wants. Given this preference, the private information reveals the consideration process, instead of the mechanical discovery process. We find that when there is an apparent conflict of interest, the longer the response time, the less credible the message. However, receivers are unable to extract substantial welfare gains through the response time. Furthermore, when senders are aware of the availability of their response time, they are able to manipulate it.

Keywords: response time, cheap talk, experiment, truth telling preference, truth discovering, deliberation

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1 Introduction

Numerous economic interactions encompass a range of indirect choice information that can profoundly influence the outcomes of interactions. These supplementary elements may take the form of diverse data, signals, or characteristics that are not directly tied to the decisions being made but nevertheless offer valuable insights or contextual understanding. In today's technologically advanced environment, Response Time (RT) serves as a highly convenient metric for the decision-making process. The emergence of modern communication technologies, including Slack, emails, and instant messaging, has significantly facilitated the tracking of RT, making it more practical and accessible.

RT can potentially be a valuable tool in addressing asymmetric information in a sender-receiver game where there is a conflict of interest. In scenarios where a car dealer is driven by the constant desire to sell the most expensive cars, there is a possibility that they may affirmatively market the highest-price vehicle in your price range without adequately verifying if the car is your best match. Similarly, influencers seeking likes and followers may comment or re-post popular articles without genuinely engaging with the content or thoroughly reading it, a home inspector who wants to promote a deal may not meticulously examine each piece of technology before providing a report to a prospective consumer. In all these examples, senders have incentive to lie only in one direction, and uncovering the truth is time costly. It is reasonable to assume that RT may provide private information about the truthfulness of the message when there is an apparent conflict of interest, i.e., the faster the message, the less likely the sender uncovers the truth, the less credible it is. Van de Calseyde, Keren and Zeelenberg (2014) have found that 64% of people trust the message with longer RT.

This research mainly aims to delve into what private information RT carries when there is a conflict of interest, and if there is a pattern between RT and truthfulness, tailored to a situation where truth discovery is time consuming. We're also intrigued by the strategic use of RT by both senders and receivers and understand how it contributes to their overall well-being. By unpacking the private information conveyed by RT and heuristics employed by receivers, we are able to make implications about how to improve the welfare of uninformed parties who used to be non-experts and non-authorities.

A cheap talk game models the sender-receiver interaction with a conflict of interest where a message is costless to transmit and receive. It is in contrast to signaling in which sending certain messages may be costly for the sender depending on the state of the world. In such a game, the sender gets private information about the truth and sends a message to a receiver. The message may disclose full information, partial information, or nothing at all. The receiver receivers the message, updates her belief of the truth and takes an action. The conflict of interest lies in that the sender always wants the receiver to take a certain action, like buying the most expensive car, while the receiver always wants to pin down the truth, like figuring out if the recommendation is the best match.

We have modified the cheap-talk game by introducing a discovery process at the outset of the game for the sender to invest effort in acquiring the truth. The difference from the conventional game is that now the sender does not exogenously get informed of the truth for free, instead, whether to become costly informed is an endogenous decision. In this adjusted setting, we define the RT as encompassing both the truth discovery process the deliberation process till the message sent.

We also modify the sender's utility by incorporating a truth telling preference. This preference is supported by the literature (see a survey conducted by Abeler, Nosenzo and Raymond (2019)) that people forgo about 3/4 of the potential gain from lying in the individual game, and senders consistently transmit more information than theoretical predictions (see the summary in Lafky, Lai and Lim (2022)).

In the modified game, we find that the sender would tell the truth if she discovers the truth. The intuition is that, if the sender would lie at a disadvantageous state after becoming informed, she'd better send the high-payoff message without becoming informed. In this way, she can avoid the cost of discovery while keeping the other expected payoffs the same.

If the sender behaves as the theory predicts, it is reasonable to assume that RT reveals if the sender uncovers the truth. The shorter the RT, the less likely the sender uncovers the truth, the less credible it is. If the receiver presumes this pattern, she would follow the long message more than the short message when there is an apparent conflict of interest. Given this obvious pattern, it's interesting to study if the sender would manipulate her RT if she knows that her RT will be observed by the receiver, and if the availability of RT will change sender's lying behavior.

We design an experiment to study the strategic use of RT. Specifically, we examine if the receiver uses RT effectively, and if the sender manipulates her RT when she is aware that it will be observed by the receiver. To answer the first question, we vary the availability of sender's RT in two treatments for the receiver: Receiver is Uninformed (RU) of sender's RT and Receiver is Informed (RI) of sender's RT. To answer the second question, we vary the awareness of RT in two treatments for the sender: Sender is Unaware (SU) of availability of RT and Sender is Aware (SA) of availability of RT. We ask each subject to play as a sender first, and then play as a receiver. In this way, all receivers have some experience about what RT may reveal before using it to make decisions.

Each subject plays three stages in an experiment. In Stage 1, subject plays as a sender and sends messages in 10 rounds. In each round, the sender decides whether to invest effort in learning the truth and then what message to send. We vary sender's treatment in Stage 1. The subjects either plays in the SU condition, or in the SA condition. In Stage 2, subject plays as a receiver receiving sender's messages only. This stage manipulates the RU condition. The receiver receives another subject's 10 messages from Stage 1 at once, and she takes 10 actions after each message. In Stage 3, subject plays as a receiver again, receiving the same sender's messages her RT. This stage manipulates the RI condition. The receiver receives the same 10 messages as in Stage 2 and corresponding RTs at once, and she takes 10 new actions after each message.

We recruited 62 subjects, 30 for the SU condition, and 32 for the SA condition. The most striking result is that senders uncovered the truth an impressive 92% of the time. More intriguingly, even when senders opted for a selfish approach, they still uncovered the truth 66% of the time. This results strongly violate our main theoretical prediction, and it implies that RT does not reveal if the sender uncovers the truth. The underlying reason might be that people are reluctant to lie, and they only lie if necessary.

Given such strong preference of getting informed of the truth, we have found that for the informed messages with a conflict of interest, the longer the RT, the higher probability of deceit. It suggests that lying is a hard decision for subjects, and requires more consideration. We also found that receivers were aware that RT might serve as an effective cue, and around half of them changed their decisions after observing RT at least once. However, they did not use it effectively. When receives had better trust more relative short messages, they did trust more long messages. We also found that senders were able to successfully manipulate their RT to their best interests, and availability of RT did not change their honesty rate.

These findings suggest that long RT is not an effective cue in detecting lies, which is also easily to be manipulated. Trusting toward the long RT is not an rational decision for receivers. Receivers might be better off if they just ignore the RT and trusting the message more when it's against the sender's interest. Speaking to the real life scenarios where it is hard to identify the discovery process, like when we ask the salesman or the physician for recommendation, if they spend more time than the time needed to figure out the truth, do not lean more trust to the recommendation with longer RT when there is apparent conflict of interest.

This research makes contributions to three areas of the literature. Firstly, it adds to the existing body of knowledge on the decision-making process by demonstrating that after the sender becoming informed, lying high-payoff messages take longer than truth-telling high-payoff messages, therefore providing evidence that serving self-interest requires a certain extent of deliberation. Secondly, it enriches the deception-detection literature by providing empirical evidence that receivers cannot effectively use the RT to detect lies, even though

RT serves as a valuable cue. Thirdly, it advances the literature on the strategic use of RT by involving the information-seeking process with decision-making processes. Interestingly, in contrast with the moral-hazard predictions, most senders choose to uncover the truth even though they finally lie to the receivers. This result suggests that even for the sender who cares self-interest the most, she still hopes to not have to lie to get what she wants. So, she would uncover the truth if it is possible, and lies only if she knows for sure that she has to.

In the remaining sections of the paper, Section 2 provides a comprehensive literature review. Section 3 models the strategic lying game. Section 4 outlines the experimental design and hypotheses. Section 5 presents the results. Section 6 portrays a calibrated model. Finally, in Section 7, the paper concludes.

2 Literature Review

This research contributes to three strands of literature. The first strand focuses on the decision-making process of lying and truth-telling. The main focus of this literature is to identify the automatic tendency in decision-making, either serving self-interest or telling the truth. The dual-system approach (Kahneman, 2011; Rubinstein, 2016) would argue that the automatic tendency is always faster than the deliberate approach. To identify the genuine tendency without strategic interaction, the literature focuses on a paradigm introduced by Fischbacher and Föllmi-Heusi (2013): subjects privately observe the outcome of a dice, report the outcome, and receive the payoff, either proportionally related to their report, or depending on the correctness of their guess. The key feature of this paradigm is that the experimenter does not observe an individual's truth, and therefore cannot identify any individual report as truthful or not. They can only identify decisions as high-payoff or low-payoff reports, and they distinguish people according to the difference between their observed reporting distribution and the statistically-predicted reporting distribution.

Greene and Paxton (2009) and Jiang (2013) have found that low-payoff reports take longer time than high-payoff reports. Greene and Paxton (2009) have also observed self-control neural activities (in the anterior cingulate cortex and ventrolateral prefrontal cortex) when dishonest people, whose high-payoff reports are much more frequent than predicted, forgo the gain. Shalvi, Eldar and Bereby-Meyer (2012) have found more high-payoff reports in the high-time-pressure condition than in the low-time-pressure condition. All the findings indicate that truth-telling requires extra self-control to resist the temptation, and is therefore a more deliberate approach, while serving the self-interest is the automatic tendency.

However, a limitation of this literature is the inability to distinguish between genuine high-payoff reports or deceptive high-payoff reports, therefore there is no solid evidence that self-interest is the automatic tendency. It's possible that self-interest also requires deliberation. Our design records the truth for each decision, therefore we are able to distinguish between the genuine high-payoff reports and deceptive high-payoff reports. We found that, contingent upon learning the truth, the latter takes longer than the former. This indicates that self-interest is not the automatic tendency, so there is some degree of hesitation. Moreover, our results show that when the transparency of RT is present, the same pattern remains even though senders condense the overall RT; this indicates that this pattern is difficult to manipulate.

The second strand of literature revolves around the identification of cues for detecting deception. This strand of literature centers on interactive games involving a minimum of two players with differing levels of information. This setup allows for the examination of scenarios where the sender has motivations to deceive and explores whether receivers can successfully discern veracity. Within this domain, researchers have explored two modes of deceptive communication: written messages and video clips.

In the case of written messages, receivers are able to detect lies by analyzing the content and linguistic characteristics. Charness and Dufwenberg (2006) found that written chat communication was highly effective in facilitating good social outcomes, with promises (and the subsequent changes in beliefs) being a key ingredient. Chen and Houser (2017) discovered that promises serve as reliable cues, leading receivers to place greater trust in them. However, other factors such as word usage and monetary references were found to be ineffective. On the other hand, video clips provide a more comprehensive set of potential cues, encompassing not only language but also nonverbal elements such as gender, facial expressions, body movements, and hand gestures. Studies conducted by Konrad, Lohse and Qari (2014), Dwenger and Lohse (2019), and Serra-Garcia and Gneezy (2021) revealed that receivers displayed only a slightly better than chance ability in detecting false reports of taxable income. In contrast, Belot and Van de Ven (2017) observed that receivers in the role of buyers were able to detect lies of sellers better than chance. Similarly, Bonnefon, Hopfensitz and De Neys (2013, 2017) demonstrated that trustors in a trust game exhibited limited ability to detect trustworthiness based on trustees' facial pictures. Todorov et al. (2015) also found that trustors easily formed first impressions from faces, although these impressions were unrelated to stable personality traits.

However, the existing literature on lie detection rarely addresses RT. Considering that previous studies, such as those conducted by Gneezy (2005) and Cai and Wang (2006), revealed that receivers tend to place greater trust in senders than what would be expected based on equilibrium predictions, there may be additional value in analyzing RT for receivers. Our research contributes to this domain by incorporating RT as a potential cue for deception detection. Our findings indicate that even when RT conveys private information, receivers fail to utilize it effectively. Furthermore, when RT is made public, receivers tend to exhibit an excessive degree of trust in senders, leading to slightly worse outcomes for the receivers.

The third body of literature focuses on the value of RT in strategic settings. This emerging literature discusses three main questions: when senders have private information, 1) whether their RTcarries private information; 2) whether receivers can extract private information from senders' RTs; 3) whether senders manipulate their RT. Frydman and Krajbich (2022) investigated the value of RT in a laboratory social learning game, while Konovalov and Krajbich (2023) examined the value of RT in a laboratory bargaining game. Both studies found that people's decision-making processes align with the drift-diffusion model (Fudenberg, Strack and Strzalecki, 2018; Woodford, 2014), which states that the longer the RT, the smaller the difference between two choices. Cotet and Krajbich (2021) extended their results to the eBay market with experienced agents. Their findings implies that senders' RT carries private information, even in the field. In addition, Frydman and Krajbich (2022) and Konovalov and Krajbich (2023) demonstrated that receivers can infer private information from senders' RTs. Furthermore, Konovalov and Krajbich (2023) discovered that individuals attempted to manipulate their RTs when they were aware that their times would be revealed, making it less informative to their counterparts. This current research extends the investigation of the value of RT to the setting where it involves the information seeking process. The intuition is that given information acquisition is costly, senders should not uncover the truth when he decides to lie, and therefore lying should be very quick in such a setting, and very informative. However, our results show that many senders uncover the truth even if they decide to lie. In addition, when senders' RT carries private information, receivers are not able to take advantage of it. Finally, senders manipulate their RT to make it more informative. These unpredicted results indicate that there are more behavioral issues involved beyond preference of truth telling.

3 Theoretical Framework

In this section, we present our theoretical framework and discuss its main predictions. The model achieves two goals. First, it captures the relationship between the sender's RT and the type of the report. Second, it highlights the contrast between the situation when the sender is not aware of the availability of the RTand when the sender is motivated to manipulate it. These features generate a rich set of predictions that we then test experimentally.

3.1 Benchmark

In the benchmark, we study the perfect Bayesian equilibria for the cheap talk game with different preferences. We start from the standard cheap talk setting in which players only care about the monetary payoffs, and then extend the model to the situations where the senders have truth telling preference.

3.1.1 Standard Cheap Talk Game

Consider a game played between a sender and a receiver. There is a state of the world, drawn from a finite-state space. Both players do not care what specific state it is, instead, they care about if the state passes a certain threshold. In other word, there are only two payoff-relevant states. We assume that only payoff-relevant states matter for different strategies, therefore, it's equivalent to assume that there are only two states, $\Omega = \{\omega_L, \omega_H\}$. Both players have the common knowledge that the prior probability of the state ω_H is $\mu_0 \in (0, 1)$.

The sender observes ω and sends a message $m(\omega) \in M = \{\omega_L, \omega_H\}$ to the receiver. The receiver observes m (but not ω) and then chooses an action $a \in A = \{\omega_L, \omega_H\}$. For the message space, we lose some generality by limiting the number of message to two. Without allowing the sender to send nothing may force the sender to tell the truth more than the rate in some real life scenarios. However, the scope of this paper is not to estimate the truth telling rate, instead, we want to study if the RTcan help detect lies of a high-payoff message. Having more people telling the truth or lying provides us more useful data.

The receiver's payoff depends on ω, but the sender's payoff does not. We take $u_R : A \times \Omega \to R$ to be the receiver's utility, and $u_S : A \to R$ to be the sender's.

A strategy for the sender maps each state of the world to a distribution over messages $s_S : \Omega \to \Delta M$. A strategy for the receiver specifies a mixed action for her conditional on every message that she may observe $s_R : M \to \Delta A$. We are interested in studying the game's perfect Bayesian equilibria. The equilibirum consists of three elements, s_S, s_R, and a belief system $\beta : M \to \Delta\Omega$; such that:

1. the receiver knows the sender's strategy s_S, and, upon receiving the report m, updates her belief $\beta(\omega|m)$ regarding the state of the world using Bayes' law;

2. given belief β, s_R is optimal for the receiver, i.e., $a(m) = \arg\max_{a \in A} u_R(a, \beta(\omega|m))$, for each $m \in M$;

3. the sender knows the receiver's strategy s_R, and s_S is optimal given s_R, i.e., $m(\omega) = \arg\max_{m \in M} u_S(a(m))$, for each $\omega \in \Omega$.

We consider the setting that the receiver wishes to match her action to the state. That is, her state-dependent payoff is $u_R(a, \omega) = h$ if $a = \omega$, and $u_R(a, \omega) = l$ otherwise, where $h > l$. A rational receiver would choose $a = \omega_H$ when her posterior belief of the high-payoff state $\beta(\omega_H|\cdot)$ is larger than 50% and $a = \omega_L$ otherwise. We assume $\mu_0 < 50\%$. That is, with the prior belief, the receiver would choose $a = \omega_L$. The sender earns a higher payoff if the receiver chooses ω_H. Specifically, her payoff is $u_s(a) = h$ if $a = \omega_H$, and $u_s(a) = l$ otherwise.

In this setting, there are only babbling equilibria, in which the receiver infers no information at all from any message and sticks to the prior belief μ_0, and the sender sends random, uninformative message. The intuition is that if there is any message that the sender can send that will make the receiver choose ω_H, then in equilibrium the sender must send it. Hence the receiver will ignore the message.

3.1.2 Cheap Talk Game with Truth Telling Preference

According to a survey conducted by Abeler, Nosenzo and Raymond (2019), people have a strong aversion to deception, and they forgo about 3/4 of the potential gain from lying in the individual game. This tendency persists in the strategic games. For strategic communication of private information, senders consistently transmit more information than theoretical predictions (see summary in Lafky, Lai and Lim (2022)). These evidence suggests that people have truth telling preference. Theoretically, it's equivalent to add a cost of lying in the utility function.

Now, we modify the sender's utility by adding a fixed cost of lying c_θ. Formally, we assume her utility function

$$u_S(a, c(\omega, m; \theta)) = -z\mathbb{1}_{a=\omega_L} - c_\theta \mathbb{1}_{m \neq \omega}, z = h - l$$

As before, a is receiver's action, ω is the true state, m is sender's message. $c(\omega, m; \theta)$ denoting the individual cost of lying. θ captures the heterogeneity of subject's weighting that applies to the lying cost. When $c_\theta = 0$, the game is the standard cheap talk game. In this section, we focus on analysis with positive lying cost, i.e., $c_\theta > 0$.

To study the new equilibrium with the positive lying cost, we study the sender's behavior first. If the cost of lying is larger than the potential benefit of lying, i.e., $c_\theta \geq z$, truth telling is a (weakly when $c_\theta = z$) dominant strategy for the sender, so she would always tell the truth, i.e., $m(\omega) = \omega$ for each $\omega \in \Omega$.

If the cost of lying is smaller than the potential benefit of lying, i.e., $c_\theta < z$, sender's optimal strategy varies on the degree of the trust p from the receiver when the receiver follows the message with probability p and ignores the message and chooses $a = \omega_L$. It's worth noting that no matter how much trust the sender can get, it's always optimal for her to tell the truth at an advantageous state $\omega = \omega_H$. Because she needs to pay the lying cost and may suffer a monetary reduction if she lies downwards. Then we focus on what's optimal for the sender at a disadvantageous state $\omega = \omega_L$. If there is a great chance to gain the receiver's trust ($p > \frac{c_\theta}{z}$), the sender would lie upwards $m = \omega_H$ because the expected payoff gain covers the cost of lying. If the chance of trust is slim ($p < \frac{c_\theta}{z}$), the sender would tell the truth because the expected payoff gain is too small and is not worth it. If the degree of the receiver's trust is just enough to cover the cost lying ($p = \frac{c_\theta}{z}$), the sender may mix her message.

Another potential strategy for the low lying cost sender is to reverse her message, i.e., reporting $m = \omega_L$ for the high payoff h and reports $m = \omega_H$ for the low payoff l. The sender would lie downward in this strategy, i.e., report $m = \omega_L$ at the advantageous state $\omega = \omega_H$. This kind of strategy can be optimal only if the sender and the receiver shares the consensus that they should translate the message in the opposite way against its face value. We assume that the receiver would not do it, either because the face value of the message is too salient, or the receiver believes that there are enough honest people in the society. In our data, there are only 4 out of 620 choices that the sender lied downward. This result supports our assumption that players would communicate with the messages' face values.

We then turn to the receiver's strategy. Since the sender would never lie downward, the receiver should always follow the low-payoff message $m = \omega_L$. The receiver's optimal action given a high-payoff message $m = \omega_H$ depends on the likelihood q that the sender tells the truth at a disadvantageous state $\omega = \omega_L$, which is defined as $q = P(m = \omega_L | \theta = \omega_L)$. If the truth telling probability is huge enough ($q > \frac{1-2\mu_0}{1-\mu_0}$), it's more likely that the high-payoff message $m = \omega_H$ is true, and the receiver should trust the message $a = \omega_H$. If the likelihood is too small ($q < \frac{1-2\mu_0}{1-\mu_0}$), the receiver should ignore the message $a = \omega_L$. If the likelihood is just enough ($q = \frac{1-2\mu_0}{1-\mu_0}$) to make the receiver indifferent by taking different actions, she may mix her actions.

Which strategy profiles that are optimal to each other depends on the predetermined magnitude of the lying cost c_θ. If there is no incentive for the sender to lie at all, i.e., $c_\theta \geq z$, the sender would tell the truth and the receiver always follows the message. We call this equilibrium the truth telling one.

Otherwise, there is no pure strategy equilibrium. Suppose that the receiver always ignores the message and takes the optimal action $a = \omega_L$, the sender will tell the truth and get the low payoff l. It's worth noting that the sender will not lie because in that way she can get an even lower payoff $l - c_\theta$. Therefore, ignoring the message is not an optimal strategy for the receiver. So, there is no equilibrium with such strategy. Suppose that the receiver trusts the sender, the sender would always send high-payoff message $m = \omega_H$ for the high payoff. In this way, always trusting the sender is not an optimal strategy for the receiver. So, there is no equilibrium with such strategy either. There is a mixed-strategy equilibrium that the sender lies sometimes ($1 - q = \frac{\mu_0}{1-\mu_0}$) at the disadvantageous state $\omega = \omega_L$, and always tells the truth at the advantageous state $\omega = \omega_H$; the receiver always trusts the disadvantageous state message, and sometimes ($p = \frac{c_\theta}{z}$) trusts the advantageous state message. The intuition is that only if they confuses the other side, they would not be exploited.

With the positive lying cost, there can be a truth telling equilibrium, a partial lying equilibrium, and furthermore, there is no babbling equilibrium.

3.2 Cheap Talk with Truth Discovery Process

In the context of the lying cost model, we are introducing an additional step at the outset of the game. Rather than being automatically informed about the true state of the world, the sender now has the opportunity to make an informed decision about whether to invest time in uncovering the truth. This mirrors real-world scenarios where a salesperson makes a choice about whether to spend time checking which is the best match for the consumer, a home inspector needs to determine whether to meticulously examine each piece of technology before providing a report to a prospective second-hand buyer, or an individual must weigh the choice of approaching a director to inquire about job openings for a friend.

Let's begin our analysis by examining the equilibrium outcome, followed by an exploration of the connections between the sender's message and her RT. Additionally, we will investigate whether the sender's decisions would differ when she is conscious of the availability of RT.

3.2.1 Without RT

Consider a game that goes beyond the basic cheap talk game by adding an extra step. Now the sender is not automatically being informed of the truth. Instead, she faces a private decision d of whether to uncover the truth costly $d = 1$ by spending some time or not $d = 0$. Whether opting to become costly informed or remain uninformed about the truth, the sender subsequently conveys a message m to the receiver, and the receiver takes an action conditional on m. The key distinction for the receiver side, compared to the benchmark scenario, lies in the awareness that any message m could originate from either an informed state ω_L, an informed state ω_H, or an uninformed state.

We assume that discovering the truth incurs a cost, which could be associated with cognitive effort and time consumption, or keep ignorance can work as a moral wiggle room (Dana, Weber and Kuang, 2007) that allows the sender to act more selfishly and provides extra utility. The sender's utility function changes to

$$u_S(f(d), a, c(\omega, m; \theta)) = -c_I \mathbb{1}_{d=1} + z\mathbb{1}_{a=\omega_L} - c_\theta \mathbb{1}_{m\neq\omega}.$$

Beyond the receiver's action a cost of lying $c(\omega, m; \theta)$, the sender's utility also depends on her discovering decision $f(d)$. She needs to pay a positive fixed cost c_I if she discovers the truth. Additionally, c_θ is predetermined prior to the revealing step.

If there is no lying cost at all, i.e., $c_\theta = 0$, the sender would babble if she has uncovered the truth. As a result, she would avoid the cost of discovering to keep uninformed and babble. Therefore, babbling is the unique equilibrium, and the sender would not uncover the truth at any time.

If sender's truth telling preference outweights the potential monetary gain and the cost of uncovering, i.e., $c_\theta > z + c_I$, uncovering the truth and delivering it is the dominant strategy for her. In this case, truth telling is the unique equilibrium and the sender would always get informed.

For the other positive lying cost, the receiver's strategy remains the similar since her information set does not change. With the no downward lying assumption, the receiver understands that the $m = \omega_L$ either from the informed state ω_L or uninformed state. Therefore, she should always trust such message, while the the action for the low-payoff message $m = \omega_H$ depends on the sender' truth telling rate q. The distinction from Section 3.1.2 lies in that the truth telling rate does not always from the known disadvantageous state, it might be the probability of discovering the truth.

The sender's strategy is different from the game with no truth seeking process. In this setting, the sender needs to consider whether she uncovers the truth first, and then what to do after each truth seeking decision. It's worth noting that the mixed the action after discovering the truth is a strictly dominated strategy. The sender can be strictly better off if she randomizes the action in the truth seeking decision than if she randomizes the truth telling rate after being informed of state ω_L. Specifically, instead of getting informed and lying sometimes (q) at the disadvantageous state, the sender can save some portion of the discovering cost by mixing the discovering decision: not discovering ($d = 0$) at the probability q and sending the high-payoff message $m = \omega_H$, and discovering ($d = 1$) the telling the truth ($m = \omega$) otherwise.

Proposition 1: The sender would report the truth if she chooses to be informed.

Given the discovering cost c_I, there are three strategies she has to consider for each trust rate p: 1) remaining uninformed and sending the low-payoff message ($d = 0, m = \omega_L$), 2) remaining uninformed and sending the high-payoff message ($d = 0, m = \omega_H$), and 3) getting informed and telling the truth ($d = 1, m = \omega$). The comparison between the first and the second strategies depends on the trust rate p. The comparison between the uninformed and informed strategies is related to the difference between the lying cost c_I and the cost of lying c_θ. When the discovering cost is too huge and the trust rate is too small ($c_I > \mu_0(pz + c_\theta), p < \frac{(1-2\mu_0)c_\theta}{z}$), the sender's optimal strategy to keep uninformed and report ω_L all the time. When the discovering cost is too huge or cost of lying is too small, and the trust rate is big enough ($c_I > (1-\mu_0)(c_\theta - pz), p > \frac{(1-2\mu_0)c_\theta}{z}$), the sender's optimal strategy is to keep uninformed and report ω_H. For the rest of the cases, it's optimal for the sender to uncover the truth and report it. The sender would mix her strategies if there is no difference between one uninformed strategy and one informed strategy.

With positive lying cost, there is truth telling equilibrium as before when the truth telling preference is pretty strong. When the discovering cost is too huge to support the truth telling preference ($c_I > \mu_0 \times c_\theta$), there is babbling equilibrium, in the way that always reporting low-payoff message $m = \omega_L$. But there is no babbling equilibrium where the sender always reporting high-payoff message $m = \omega_H$. Because in this way, the sender cannot gain the receiver's trust and therefore she'd better report $m = \omega_L$ to save a portion of the lying cost. There is no equilibrium when the sender mixes the uninformed low-payoff message and the informed one. Because, in that way, the receiver should always trust the sender, therefore the sender is better-off if she remains uninformed and reports the high-payoff message all the time. There is a mixed strategy between an informed strategy and the uninformed and high-payoff one. The sender would discover the truth with probability $q = \frac{1-2\mu_0}{1-\mu_0}$ and tells the truth, otherwise sends the high-payoff message $m = \omega_H$. The receiver would always trusts the disadvantageous state message, and trust the advantageous state message with probability $p = \frac{c_\theta - \frac{c_I}{1-\mu_0}}{z}$.

In summary, there are three different types of babbling with positive discovering cost: getting uninformed and babbling, getting informed and truth telling, and partial discovering. The key distinction from the previous model is that the sender would always tell the truth if she gets informed of the truth, and in equilibrium, the suspicious behavior is always pertaining to keeping uninformed.

3.2.2 With RT

Now consider the game that the receiver possesses an additional piece of information about the sender's decision – her RT. This RT indicates the duration between when the sender initiates the process of making informed decision and when she eventually transmits her message.

Let's initially delve into the sender's behavior. In SU condition, the sender is unaware of the availability of RT, and there is no motivation for her to manipulate RT, and as a result, RT accurately reflects the genuine mechanical and decision-making process. If the sender does not consistently opt for being uninformed and babbling or consistently opt for being informed and telling the truth, RT contains private information about her type of message. Given *Proposition 1*, a very short RT suggests that the sender does not uncover the truth. Furthermore, if the RT carries private information, it's beneficial for the sender to manipulate the disadvantageous RT to be as long as the advantageous RT. The findings in Konovalov and Krajbich (2023) support this RT manipulation idea. We hypothesize that this relationship is weaker (but does not vanish) in the SA condition.

Hypothesis 1: In both SU and SA, the faster the y report, the less credible it is.

We then consider how the sender manipulates RTs in the SA condition, focusing on the sender who takes the mixed strategy. If the sender thinks the receiver uses the RT to detect lies, she may deliberately prolong her RT for an uninformed decision, feigning an extended process of uncovering the truth. This is a great opportunity for the sender to persuade the receiver that she tells the truth all the time and deserves the trust. In this way, the sender manipulates the RT gap between two types of high-payoff messages to be smaller in the SA condition than in the SU condition.

Hypothesis 2: In the SA condition, the sender will prolong her RTon average.

In the SA condition, we further assume that the method employed by the sender to extend her RT to a reasonable duration involves following the steps necessary to genuinely uncover the truth. If this is true, even the sender decides to serve the self-interest, she may uncover the truth in this scenario. Because the cost associated with lying after discovering the truth, at state ω_L, is greater than the expected value of the lying cost when remaining uninformed and sends the high-payoff message ω_H, represented as $c_\theta > \mathbb{E}c_\theta = (1 - \mu_0)c_\theta$, the sender may be inclined to shift from their initial strategy of remaining uninformed to becoming informed and truthfully reporting. Consequently, in a situation where the sender is aware of the availability of RT, there is a general tendency for her to communicate more truth.

Hypothesis 3: In the SA condition, the sender is more likely to get informed, and are more likely to tell the truth than in the SU condition.

We then make hypotheses for the receiver's actions. If Hypothesis 1 is correct, the receiver can leverage RT to make more informed decisions instead of randomizing whether trust or not given the disadvantageous state message. When the sender's RT is exceedingly short, that is, when RT is significantly smaller than a certain minimum time threshold denoted as $\underline{t}$, it indicates that the sender did not invest enough time to uncover the truth. In this case, the receiver should make decisions based on the prior distribution and opt for ω_L. Conversely, when RT exceeds this minimum threshold, it implies that the sender may have taken the necessary time to discover the truth and is likely to report honestly. Consequently, the receiver should place more trust in the sender's message and act accordingly. Hypothesis 4a is based on the assumption that the receiver correctly presumes the pattern in Hypothesis 1. If it is true, the receiver is better-off by knowing RT, and is more better-off in the SU condition than in the SA condition.

Hypothesis 4a: The receiver is less likely to follow the short y report in the RI condition than in the RU condition. The difference between the two conditions is smaller in the SA condition than in the SU condition.

Another possibility is that the receiver may think that truth telling is automatic, and views the long RT as more suspicious, as the drift-diffusion model predicts, and therefore trusts the shorter y report more. If it is true, the receiver is worse-off by knowing RT, and is more worse-off in the SU condition than in the SA condition.

Hypothesis 4b: The receiver is less likely to follow the long y report in the RI condition than in the RU condition. The difference between two conditions is smaller in the SA condition than in the SU condition.

Last but not least, we're interested in the demographic characteristics in this setting. Gender is a salient demographic feature. The meta-analysis over 380 experiments conducted by Gerlach, Teodorescu and Hertwig (2019) suggests that men behaved slightly more dishonestly than women did. Hypothesis 5a extends the gender differences into truth uncovering, lying detection and manipulation of RT.

Hypothesis 5a: Females and males are different in uncovering the true states, truth telling, manipulating the RT, and detecting lies.

Creativity is considered one of the most important skills nowadays. A meta-analysis over

36 studies conducted by Storme, Celik and Myszkowski (2021) have revealed a weak positive correlation between creativity (measured via the self-report Gough scale), and dishonesty. Given that creative people are more likely to lie, we further conjecture that they are better at detecting lies. Hypothesis 5b posits such heterogeneity.

Hypothesis 5b: The subject who is creative is more likely to lie as a sender and is better at detecting lies as a receiver.

4 Experimental Design

In this section, we describe the laboratory implementation of our model, the main treatments that we conducted.

We begin by describing the implementation of the base game. Six dice are available to be rolled. For each die, there are six possible outcomes, 1, 2, 3, 4, 5 or 6. We define 4, 5, 6 as "large numbers", and 1, 2, 3 as "small numbers". The true states related to the outcome of six dice about whether there are 4 or more large numbers, yes (where there are 4 or more "large numbers" on 6 six-sided dice) or no (where there are 3 or fewer "large numbers"). The sender has a chance to uncover the outcome of each die. Her message can be yes or no.

The receiver's decision, along with the true state, determined the payoffs for both the sender and the receiver as listed in Table 1. The receiver earns \$8 if she correctly guesses the answer of the question. She earns \$4 otherwise. The sender earns \$8 if the receiver guesses that the answer is yes, irrespective of truth. She earns \$4 otherwise. Given this, the prior is $\mu_0 = 34.37\%$. To present our results, we adopt the following notation to distinguish between states, messages, and actions: $\omega = \{yes, no\}$, $m = \{y, n\}$, $a = \{YES, NO\}$.

Truth/Receiver's guess	YES	NO
yes	(\$8, \$8)	(\$4, \$4)
no	(\$8, \$4)	(\$4, \$8)

Table 1: Monetary Payoff: the first item denotes the sender's payoff, the the second item denotes the receiver's payoff.

We vary treatments in two dimensions as in Table 2. The first dimension revolves around the SU and SA conditions. We do not mention anything about RT to senders in the SU condition, and tell senders that their RT corresponding to each message will be recorded and provided to receivers in the SA condition. Each sender would only participant in one treatment, either SU or SA. So, we are able to make between-subject comparison for senders' behavior. The second dimension pertains to the RU and RI conditions. Receivers only receiver the information about senders' messages in the RU condition, and they receive additional information about senders' RT corresponding to each message in the RI condition. Each receiver would take part in two conditions, both RU and RI. So, we are able to make within-subject comparison for receivers' behavior.

	Sender Unaware (SU)	Sender Aware (SA)
Receiver uninformed (RU)		
Receiver informed (RI)		

Table 2: Treatments

We asked each subject to play as a sender first, and then play as a receiver. This will aid the receiver in acquiring insights into the expected RT of each round and the probability associated with the occurrence of advantageous states. There are three stages in the experiment as described in Figure 1. In stage 1, subject played the role of a sender, and they were randomly assigned to either the SU or SA condition. In the SU condition, senders were unaware if their RT would be provided to the receiver in the later stage. In the SA condition, senders were aware that their RT would be reported to the receivers.The sender faced an independent series of true states for 10 rounds. At the beginning of each round, 6 computer-generated dice was initially covered, and the sender decided if she would uncover each of them by clicking on the corresponding button. To find out the true state, senders would have to click on buttons to uncover at least three dice, which takes time. In fact, for all informed messages, senders clicked all 6 buttons more than 90% of times. The minimum of the time use for the informed message was 5 seconds in the SU condition, and 4 seconds in the SA condition. Senders have the freedom to uncover any number of the dice, including none, before sending a message. At the end of each round, the sender need to select a message, y (There ARE 4 or more large numbers of the 6 dice) or n (There ARE NOT 4 or more large numbers of the 6 dice), sending to the receiver. In total, each sender sent 10 independent messages at the end of stage 1.

In stage 2, subject played the role of a receiver. Each receiver would receive 10 messages from a non-self sender and had to guess the true state for each round, YES or NO. All 10 rounds of messages were provided at once to the receiver. This allows for the comparison of RTs across rounds in the RI condition, aiding in the assessment of whether a specific RT is fast or slow. In stage 3, subject played the role of a receiver again. In this stage, the receiver not only got the messages from the sender, also the sender's RT for each round. As in stage 2, all 10 messages and the corresponding RTs were provided at once.

Comprehensive questions were included in each stage to ensure that subjects understood the instructions. After completing the three stages, a survey was conducted to collect gender

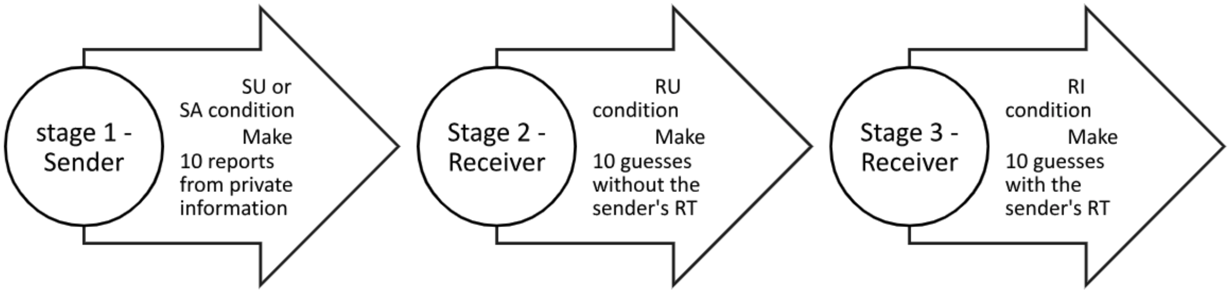


Figure 1: Experiment Timeline

and personality information from each subject.

Each subject participated in 10 matches in RU condition, and 10 matches in RI condition as a sender and as a receiver. We paid them for two roles. To determine the payment, we rolled a 10-sided die twice. The first roll determined which condition would count: an odd number indicated that the RU condition would count, while an even number indicated that the RI condition would count. The second roll determined which of the 10 rounds for each role would count. For example, 2 and 9 mean that the subject would be paid for the 9th match as a sender in the RI condition, and for the 9th match as a receiver in the RI condition. Subjects were also paid an additional $1 for completing the survey.

5 Results

The experiment was conducted at the Experimental and Behavioral Economics Laboratory at University of California, Santa Barbara, from May 11 to May 16, 2023. We recruited 62 subjects, 30 for the SU condition, and 32 for the SA condition. The subject earned an average of $13 for about 1 hour in the lab.

We collected 10 observations from each subject as a sender, and 20 observations as a receiver. In total, for the sender side, we collected 300 observations in the SU condition and 320 observations in the SA conditions. For the receiver side, we collected 620 observations in both the RU and the RI condition.

In this section, we would test the hypotheses about the senders' and receivers' behavior. We examine what RT reveals about the truth, if the receiver uses the RT, and if the sender manipulates RT.

5.1 Senders' Behavior

First, we test if senders' behavior is consistent with the theoretical prediction. Predicted by *Proposition 1*, a rational sender would be truthful if she discovers the truth, and all selfish decisions are made without being informed. We then examine if the relationship between RT and veracity of the message is consistent with Hypothesis 1, specifically, we investigate whether long y is more credible than the short y.

Table 3 presents the average and standard error of RT for each type of decision. We define the genuine message as the one that the sender uncovered enough buttons to get informed of the true state and reported truthfully, the deceptive message as the one that the sender got informed of the state and lied, the uninformed message as the one that the sender sent without uncovering enough buttons to get informed of the truth.

SU (obs.)	Mean (s.e.)	SA (obs.)	Mean (s.e.)
genuine y (86)	12.10s (1.06s)	genuine y (87)	10.85s (0.74s)
genuine n (138)	13.48s (0.87s)	genuine n (160)	12.62s (0.66s)
deceptive y (51)	13.10s (0.95s)	deceptive y (45)	12.67s (0.83s)
deceptive n (1)	9s (0s)	deceptive n (3)	13.33s (1.33s)
uninformed y (24)	8.83s (2.34s)	uninformed y (25)	6.84s (1.27s)

Table 3: Mean and standard error of RT for difference messages

More deceptive y than the uninformed y suggests that sender's behavior severely violates *Proposition 1*, which claims that senders would uncover the truth only if they decide to be honest. Overall, senders uncovered the truth 92% of the time (92% in both SU and SA conditions). For senders who used mixed strategies, excluding those who always sent y or who always told the truth, they uncovered the truth 86% of the time (97% in the SU condition, 77% in the SA condition). Furthermore, for all selfish message y, senders uncovered the truth 66% of the time (68% in the SU condition , and 64% in the SA condition). All the findings suggest that senders prefer to get informed of the truth before making selfish decisions.

One potential reason for such demand for the truth information is that people are reluctant to lie. Not only they prefer to tell the truth after knowing it, they also do not want to lie if not necessary. Keeping uninformed and sending selfish message y can sometimes be consistent with truth telling, rendering lying unnecessary. Lying becomes a necessity only when she becomes aware of the disadvantageous state ω_L and seeks to leverage the recipient's trust for a greater payoff. With the reluctance to lie, the sender would always discover the truth.

Given the violation of *Proposition 1*, RT seldom reveals whether the sender uncovered the truth. Here comes our first main result.

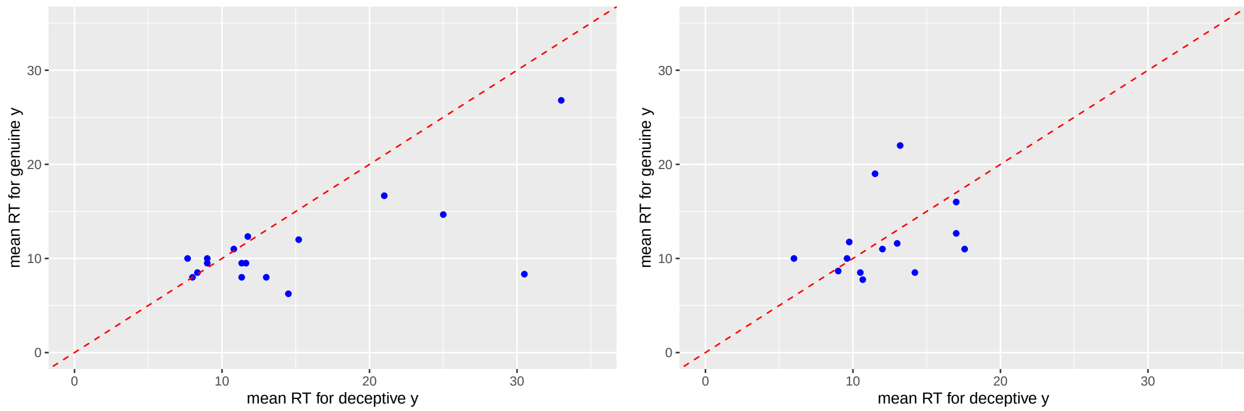
Result 1: RT in the cheap talk game with truth discovery process does not reveal if the sender uncovers the truth.

Except for the mechanical truth discovery process, RT also includes the deliberation process about what message to send in different states. Since the truth discovery process is unrelated with RT, RT mainly reveals the time for deliberation process. We examine if RT carries private information about the veracity of the message in this way. Since only 4 out of 620 times that senders lied downward, almost all (99%) n reports were supposed to be genuine ones, regardless of RT. Therefore, RT does not carry private information about the veracity of n reports. However, given the overall 46% dishonesty rate (including lying and uninformed reports) for y reports, RT may have added value on detecting veracity of those ones. We first investigate if there is any relationship between RT and veracity of message y in the SU condition, where the senders had no incentive to manipulate RT, and then examine the relationship in the SA condition to study if the senders manipulated RT when they were aware of its availability.

In the SU condition, we proceed to dig into the heterogeneity of y reports by comparing different reports with the genuine y report, which serves as the easiest form requiring no additional temptation. Any extension of the time signifies an intrinsic cost involved. We find that genuine n reports took 1.38 seconds longer to process compared to genuine y reports ($p > 0.30$, not significant), which supports the notion that adhering to truthfulness by foregoing potential gain requires considerable self-control and effort. Deceptive y reports took 1 second longer to formulate compared to genuine y reports ($p > 0.40$, not significant), suggesting that there is a positive cost associated with lying.

Our findings are consistent with the literature that truthful and disadvantageous decisions (n reports in our experiment) take longer than the selfish and fortunate ones (y reports in our experiment), which supports the notion that disadvantageous truth telling requires deliberation (Greene and Paxton, 2009; Jiang, 2013; Shalvi, Eldar and Bereby-Meyer, 2012). In our experiment, we are able to further compare the selfish and fortunate decisions, which suggests that selfish decisions take longer than the fortunate ones. This finding suggests that RT may be useful in lying detection.

The descriptive statistics displayed in Table 3 lack the capacity to discern variations in RT at the individual sender level. Not every sender makes different types of reports. In the SU condition, 11 out of 30 subjects told the truth all the time, while 17 of them reported both genuine and deceptive y, and the remaining 2 subjects always babbled without being informed. As each receiver exclusively engaged with a single sender, it becomes imperative to explore potential differentials in RT at the individual level. We draw the relationship between the RT for genuine y and RT for deceptive y in Figure 2.



(a) SU condition

(b) SA condition

Figure 2: Relationships between RT for genuine and deceptive y. Each data point represents an individual subject. The x-axis denotes her average RT for deceptive y report(s), and y-axis denotes her average RT for genuine y report(s). The red dashed line is the 45-degree line.

Each data point represents an individual subject. The x-axis denotes her average RT for deceptive y report(s), and y-axis denotes her average RT for genuine y report(s). If a point falls on the 45-degree line, it indicates that there is no difference in RT between these two reports. Panel (a) represents data from 17 subjects in the SU condition. The majority of data points are located in the lower triangle, implying that the deceptive y takes longer time than the genuine y.

We then test the significance of difference in RT at the individual level. To mitigate concerns regarding confounding factors and accommodate the heterogeneity in average decision-making time among senders, we employ a fixed effect model as equation 1. This analytical approach effectively controls for unobserved sender-specific factors that may drive the differences in means, thereby allowing us to robustly assess the nuanced disparities in RT across various message types. In addition to addressing the concerns, we also account for the number of rounds in our analysis. This adjustment is necessary as decision-making speed tends to increase over time due to the heightened familiarity with the context.

$$RT_{ir} = a_i + b \times Message_{ir} + d \times r + \epsilon_{ir}. \quad (1)$$

Within our analytical framework, RT_{ir} is sender i's RT at round r. $Message_{ir}$ assumes a crucial role by effectively categorizing sender i's message at round r into five distinct classifications as shown in Table 3: genuine y, deceptive y, genuine n, deceptive n, or uninformed

y. We take the genuine y as the benchmark, and b capture the differences between any other message and genuine y reports. We also control the time trend (see Appendix B1) through incorporating the round number and control individual idiosyncrasies through a_i. ϵ_{ir} captures the random noise.

Table 4 describes the ordinary least squares (OLS) regression results. Column 2 presents the outcomes conducted under the SU condition. The coefficient of genuine n is not significant ($p = 0.15$), which means for a specific round, there is no significant difference between two genuine reports. This observation implies that the self-control efforts required by forgoing potential gain is not too much. Then we focus on the key of our study, if RT carries private information about the veracity of y reports. Within the realm of y reports, it is noteworthy that deceptive ones take significantly 4 seconds longer compared to genuine ones ($p < 0.03$), while uninformed ones take roughly 5 seconds shorter, albeit without statistical significance ($p = 0.35$), due to the relatively limited prevalence of such behavior among senders. The results are robust if we exclude round 1 when subjects needed time to get familiar with the task or if we only use the last 5 rounds when subjects were pretty familiar with the task.

These findings implies that putting the extremely short RT aside, a longer RT for a y report is associated with a higher probability of deception in the SU condition. 3.6 seconds difference between a genuine y and a deceptive y accounts for 30% of the average RT of a genuine y, suggesting that RT might serve as a cue to detect lies if receivers presumed this pattern.

We then run robustness check to further test the relationship between RT and veracity of report y in the SU condition. First, we ran individual OLS regressions, among 17 subjects in the SU condition who reported both genuine y and deceptive y, 14 subjects displayed a positive relationship between RT and deception (3 were significant at 10% level), while 3 subjects displayed the negative relationship (none of them were significant). We also check if the RT of a deceptive y is more likely to be above the median of the 10 RTs from a sender than a genuine y. We randomly break the ties. Figure 3 presents the probability of being above the median for two different y in the SU condition. The blue bar says that for all genuine y, 43% of them above the median, while for all deceptive y, 61% of them above the median. The roughly 20% difference of the two probabilities is significant at 5% level. The result is robust if we control the round and if we use the clustered standard error at the individual level.

All empirical evidence illustrates that a longer y message correlates with a higher probability of deceit without RT manipulation, which contrasts Hypothesis 1. This result underscores the importance of understanding of what RT reveals. When RT reveals deliberative

	Dependent variable: RT	
	SU	SA
Genuine n	1.733	2.028^{**}
	(1.197)	(0.874)
Deceptive y	3.561^{**}	1.167
	(1.632)	(1.275)
Deceptive n	-5.615	0.109
	(8.788)	(3.858)
Uninformed y	-4.623	-4.093^{**}
	(4.909)	(2.074)
Round r	-1.176^{***}	-1.145^{***}
	(0.167)	(0.117)
Constant	17.680^{***}	15.665^{***}
	(2.931)	(2.085)
Individual Fixed Effect	✓	✓
Observations	300	320
R^2	0.358	0.445
Adjusted R^2	0.276	0.374
Note:	*p<0.1; **p<0.05; ***p<0.01	

Table 4: Fixed Effects Regression Results: standard error in the parenthesis.

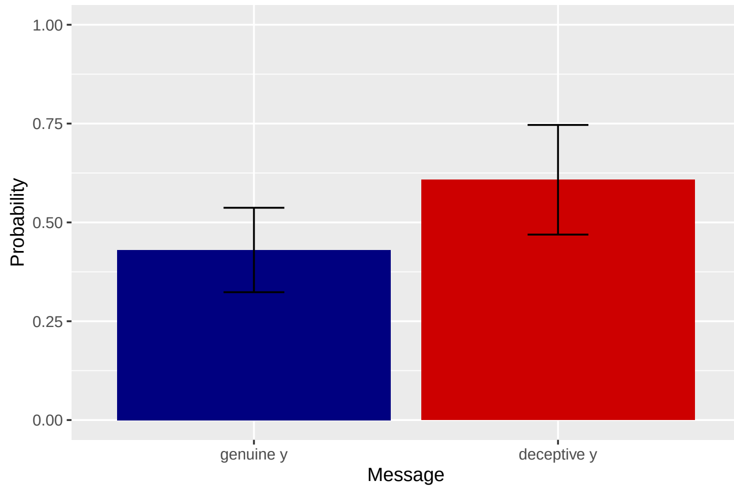


Figure 3: Probability that RT is longer than the median in the SU condition: The height for the blue bar is 43%, and the height for the red bar is 61%.

process regarding whether to engage in deception, as opposed to the mechanical process, the longer the RT, the more likely that the sender is lying. This result suggests that lying is not a hasty act and often involves considerable contemplation. Thus, we present our second key finding.

Result 2: For the informed decisions, the longer the y message, the higher probability of deceit.

One may consider that different message may request different button clicks. We found that for the informed message, more than 90% of senders clicked all six buttons, and there is no large difference between lying and truth telling messages, and between *yes* and *no* states. We also checked the robustness of the results by involving the number of button clicks, and Result 2 remains the same. See the distribution of number of buttons clicked in Appendix B2.

Should *Proposition 1* and Hypothesis 1 fail to hold, it naturally results in the failure of Hypothesis 2. Senders would not prolong their RT. However, given the interplay between RT and the realm of private information, it's still rational for the sender to manipulate RT. The sender, in an ideal setting, would strategically truncate the internal process of struggling when they lie for y, rendering them indistinguishable from the genuine ones. Overall, the behavioral patterns of senders align conspicuously with the conjecture. The average RT in the SA condition is 11.70s, shorter than the average 12.63s in the SU condition. Column 5 in Table 3 shows that almost all types of reports' RTs are shorter and less dispersed under

SA condition than under SU condition. Evidently, this lends credence to the notion that senders deliberately curtailed hesitation as they manipulated their RT.

We then examine if senders successfully make the RT less informed, especially for y reports. Table 3 says that, in the SA condition, deceptive y reports are remarkably 1.77 seconds longer on average than genuine y reports ($p = 0.10$). This finding, pointing in the same direction albeit with a higher level of significance, underscores the enduring nature of the inherent contemplation preceding dishonesty. Conversely, unknown y reports are on average significantly 4 seconds shorter than the genuine ones ($p < 0.01$). It's worth noting that this particular outcome is influenced by an individual who consistently tends to promptly opt for the y reports. Upon excluding this outlier, the gap between diminishes to 1.14 seconds, much smaller than 3.27 seconds under the SU condition, and ceases to be statistically insignificant ($p > 0.48$).

The above statistics do not take individual heterogeneity into consideration. In the SA condition, 13 out of 32 subjects told the truth all the time, while 14 of them reported both genuine and deceptive y, and the remaining 5 played mixed strategies, without lying or reporting genuine y. Panel (b) in Figure 2 represents data from 14 subjects who both reported genuine y and deceptive y in the SA condition. The data points are distributed fairly evenly around the 45-degree line, suggesting that there is no substantial difference in RT between the two reports.

Column 3 in Table 4 shows the results of a fixed-effect regression. It indicates that the deceptive y reports bear no statistically-significant distinction from genuine y. It suggests that the senders successfully pooled the genuine and deceptive y reports, and the discernible dissimilarity in overall outcomes appears to be predominantly influenced by a subset of outliers. Thus, we present our third result.

Result 3: In the SA condition, the sender manipulated RT to carry less information than in the SU condition. This is achieved through the compression of all RTs.

Should Hypothesis 1 fail to hold, Hypothesis 3 should not hold either. As senders did not uncover more truth in the SA condition compared to the SU condition, it follows that there should be no discernible truth rate distinction. We compare the honest rate under two conditions. Figure 4 presents the CDF of the number of honest reports. Notably, the p-value derived from the KS test surpasses 0.75 for both one-sided and two-sided tests. This outcome strongly suggests a near absence of disparity in terms of reporting behavior. We also test the honesty rate for states *yes* and *no*, separately. There is no significant difference between two conditions. See more details in Appendix B3.

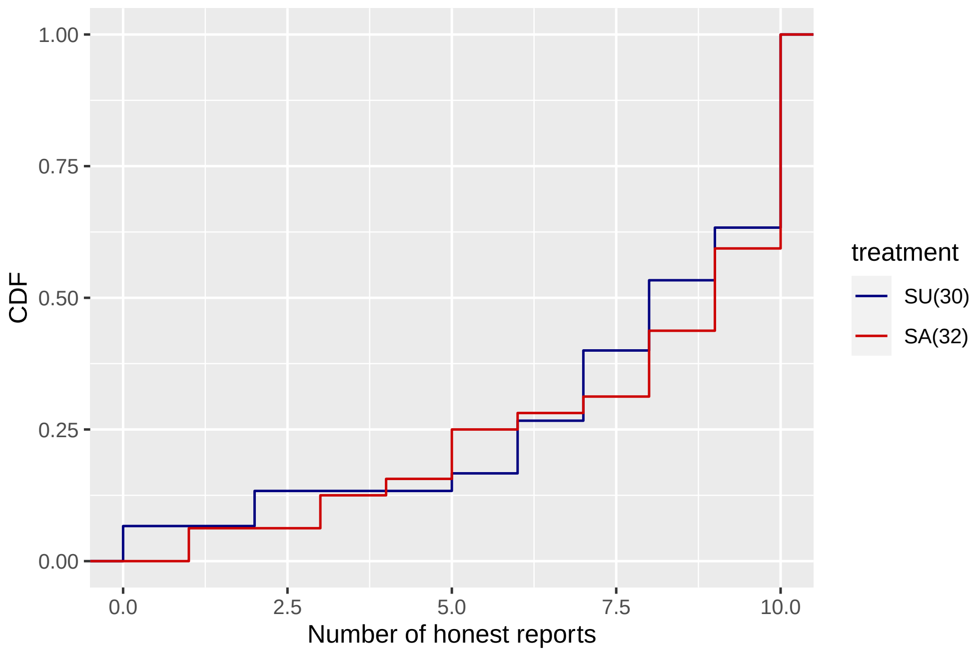


Figure 4: CDF of honesty rate

We present our fourth result.

Result 4: The awareness of RT availability did not alter senders' honesty rate.

In summary, regarding the behavior of the senders, we observe that they exhibit a reluctance to lie when deception is unnecessary. This reluctance leads to a high rate of truth discovery. In cases where individuals are informed, longer RT are associated with a greater likelihood of deceit. Interestingly, the availability of RT does not appear to significantly alter their behavior, and they demonstrate the capacity to manipulate RT to reduce its informativeness.

5.2 Receivers' Behavior

Investigating the extent to which receivers incorporate RT in stage 3, characterized by their access to senders' RTs, initially appears to offer a straightforward trajectory of inquiry. However, it remains crucial to recognize the potential presence of confounding variables, such as the aggregate frequency of y reports and social preference, that might dominate the sole primacy of RT within their decision-making framework. The transition from the absence of RT visibility in stage 2 (RU) to its prominence in stage 3 (RI) enables an assessment of RT's supplementary value in shaping receivers' decisions.

First, we investigate whether there is potential added value of RT in terms of the accuracy of receivers' guesses. Table 5 illustrates the receivers' accuracy rate in stage 2 (RU) after observing different reports. Column 2 presents the statistics in the SU condition. In the absence of RT, receivers tended to manifest a notably accuracy rate of 87.8% when responding to n reports. However, this proficiency notably waned to 69.6% when countering y reports. Column 3 presents the statistics in the SA condition, it becomes apparent that the accuracy rate in the absence of RT under the SA condition remains comparable to that observed under the SU condition. The relatively modest accuracy rates associated with y reports underscore the receivers' requirement for supplementary assistance in ascertaining the veracity of such reports in both conditions. An optimization in their decision-making could be attained by harnessing RT to effectively discern deceptive reports from genuine ones, thus improving welfare.

Sender's Report	SU(RU)	SA(RU)
No	87.8%	90.2%
Yes	69.6%	65.0%

Table 5: Receiver's Accuracy Rate Without RT

We then study if receivers exploited RT to make decisions. Table 6 provides an overview of the shifts in decision-making among the receivers during the transition from stage 2 to stage 3. Column 2 presents intricate dynamics observed under the SU condition. On the whole, there is a discernible adjustment of 13% in the receivers' choices from 13 receivers (43% out of 30), indicative of a concerted effort to enhance their decision accuracy. A deeper analysis of the contingent transition rates, the transitions between trusting and not trusting, and vice versa, following the reception of each individual report, raises intriguing insights. Given Result 2 that RT carries no private information for n reports and longer RT implies a lying y in the SU condition, ideally, the receivers should keep their action unchanged for n reports, and trust long y reports less. The proportional equivalence in transition numbers observed between the bidirectional change under each report suggests that the receivers' endeavors to recalibrate their behaviors might not yield the anticipated effectiveness.

Column 3 presents intricate dynamics observed under the SA condition. Based on Result 3 that senders successfully manipulate RT to be not informative, receivers should not rely on RT to make their decisions. A discernible adjustment of 16% in receivers' choices from 17 receivers (53% out of 32) suggests that receivers tried to use RT to enhance accuracy.

We proceed to test Hypotheses 4a and 4b about how receivers adjusted their decisions for y reports based on RT. In addition, given our finding that there were non-necessary choice changes for n reports, we further study what heuristics that receivers used in exploiting RT.

	SU	SA
Total Change	38 (13%)	52 (16%)
No. of people changed	13 (43%)	17 (53%)
$m = n$, change from NT to T (No.)	11 (4)	7 (4)
$m = n$, change from T to NT (No.)	8 (5)	12 (7)
$m = y$, change from NT to T (No.)	8 (5)	18 (7)
$m = y$, change from T to NT (No.)	11 (8)	15 (10)

Table 6: Receiver's decision change: NT denotes not trust, T denotes trust, No. in the parenthesis denotes how many people changed decisions.

Building upon Result 2, which establishes a negative correlation between the length of RT for a y report and its perceived credibility, the hypotheses given that the receiver correctly presumed the pattern are slightly different than in Section 3. She was less likely to follow the long y than the short one in general. To empirically test if it is true, we employ an fixed effect OLS regression model as framework 2 for 4 subsets, including $m = n$ and trusted without RT, $m = n$ and distrusted without RT, $m = y$ and trusted without RT, $m = y$ and distrusted without RT:

$$change_{ir} = a_i + b \times RTscale_{ir} + c_r + \epsilon_{ir} \tag{2}$$

The variable of interest is $change_{ir}$, which takes a value of 1 if the receiver i changed her guess at round r , and 0 if receiver did not change her guess. $RTscale_{ir}$ assumes a crucial role by effectively categorizing receiver i's observed RT at round r into three distinct classifications: Median of 10 observed RT, Below Median, or Above Median. We take the Below median as the benchmark, and b capture the effect difference between Median, Above and Below. We also control individual fixed effect and round fixed effect by a_i and c_r. ϵ_{ir} captures the random error. Table 7 presents the outcomes of the fixed-effect OLS regression.

In result Column (1)-(4), we present the findings pertaining to the situation under the SU condition. Column (1) states that when receivers change from trust some high-payoff message y to not trust, they did not rely on RT. Column (2) states that receivers were 28% more likely to trust a longer y message than a short one. Column (3) states that receivers were 9% more likely to distrust a long n message than a short message. There are only 16 observations in Column (4), we prefer not to infer too much information from it. Overall, when receives had better trust relative short y message, they did trust long y message; when receivers' should always trust n message, their trust did rely somehow on RT, and they trust the shorter one more than the long one. This finding suggests that receivers are not clear about the relationship between RT and veracity of the message in the SU condition. They

	Dependent variable: change							
	SU				SA			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	y,T	y,NT	n,T	n,NT	y,T	y,NT	n,T	n,NT
Median	-0.002	0.281*	0.080	−2.000***	−0.191*	0.192	0.040	1.273
	(0.136)	(0.149)	(0.086)	(0.000)	(0.104)	(0.329)	(0.073)	(0.997)
Above	-0.045	0.288***	0.089*	0.000	-0.132	0.115	-0.028	0.455
	(0.070)	(0.102)	(0.049)	(0.000)	(0.083)	(0.157)	(0.051)	(0.745)
Individual FE	✓	✓	✓	✓	✓	✓	✓	✓
Round FE	✓	✓	✓	✓	✓	✓	✓	✓
Constant	0.215	-0.137	-0.035	0.000	0.336	-0.188	-0.052	0.364
	(0.176)	(0.172)	(0.119)	(0.000)	(0.228)	(0.270)	(0.126)	(0.873)
Observations	102	59	123	16	118	39	148	15
R^2	0.485	0.586	0.518	1.000	0.399	0.788	0.454	0.708
Adjusted R^2	0.200	0.385	0.331	1.000	0.110	0.575	0.264	-0.364
Note:						*p<0.1; **p<0.05; ***p<0.01		

Table 7: The Effect of RT on Receiver's Change Decision

did not show consistent suspicion toward long or short messages. They sometimes suspected the short one, sometimes suspected the long one. As a result, even though they tried to use it, they used it ineffectively.

Column (5)-(8) present the findings in the SA condition. The overall result says that receivers seldom used RT to make decisions in this condition, which was pretty rational given that senders successfully manipulated their RT. We present our result of receivers' behavior.

Result 5: In the SU condition, receivers trusted the short y than the long y, and they distrust the long n than the short n. They relied less on RT in the SA condition.

Given the insufficient use of RT in the SU condition, receivers' welfare did not increase after knowing RT in the SU condition (p=0.84 in two-tailed test). There was no significant change in receivers' welfare in the SA condition (p=0.35). As a result of receivers' behavior, there were no significant differences in senders' expected payoffs after revealing their RT in both conditions (p=0.61 in SU, p=0.52 in SA). See more details of payoff comparisons in Appendix C.

5.3 Heterogeneity

This section delves into an exploration of the potential impact of gender and creativity traits on subjects' behavior. These attributes are assessed through self-report methodologies in the post-experiment survey. Specifically, our attention centers on the veracity of disclosures, the inclination towards trust, and the resultant payoffs. The descriptive statistics are synthesized in Table 8, detailing the results concerning gender and creativity across two conditions. A meticulous examination of the data reveals a lack of significant disparities in gender, but subjects under SU condition have higher creativity score than those under the SA condition ($p = 0.03$). Given the small observations under each treatment, we pool the data together for analysis.

	SU	SA
Gender	M 11, F 18, O 1	M 11, F 20, O 1
Creativity: mean(s.e.)	3.83(0.59)	2.09(0.51)

Table 8: Gender and Creativity Statistics. M for male, F for female, O for other. The creativity score is measures by the Gough personality scale, ranging from -12 to 18. A higher score indicates greater creativity.

Commencing with an analysis of gender-based heterogeneity in behavior, we observe notable distinctions. Specifically, in terms of the honesty rate, male subjects exhibited a truth-telling rate of 64.5%, whereas their female counterparts demonstrated a heightened rate of 82.1%. This significant discrepancy ($p = 0.04$) underscores a gender-related variance in truthfulness, elucidating the propensity of female subjects to lean towards honesty within the experimental framework.

Turning to the assessment of trust rates, our examination reveals small and insignificant gender-related patterns. For male subjects, the trust rate registered at 74.1% in the absence of RT (RU) and remained fairly consistent at 73.6% when RT is informed (RI). Female subjects manifested trust rates of 81.1% without RT (RU) and 80.8% with RT (RI). The overall disparity magnitude is around 7%, which is about one choice difference. However, the observed inter-gender differences within each condition do not attain statistical significance ($p > 0.40$ for both RU and RI conditions). In light of these findings, it becomes evident that females leaned slightly more, though not significant, towards an overarching inclination for trust.

Examining expected payoffs from the sender's perspective, male subjects achieved an anticipated payoff of \$5.50 under both the RU and RI condition, whereas female subjects secured an expected payoff of \$5.70 under both the RU and RI conditions. Female senders' slightly higher expected payoff, though not significant ($p > 0.3$ for each condition) suggests that females benefited from telling more truth. Shifting to the expected payoffs in the role of receivers, male subjects realized \$7.30 under the RU condition and \$7.20 under the RI condition, whereas their female counterparts received \$7.00 and \$6.90, separately. Remarkably, the disparity by gender proves significant ($p = 0.10$) under the RU condition, while it loses significance ($p > 0.2$) under the RI condition. This finding suggests that males gained advantage from suspicion, particularly when they are devoid of the opportunity to use RT. We now wrap up the overall gender heterogeneity.

Result 6: Females tend to tell more truth and trust others more. Males gain advantage from suspicion as a receiver, when they are devoid of the opportunity to exploit RT.

We subsequently investigate the impact of creativity on various outcomes. Creativity is quantified using the Gough Scale (Gough, 1979). According to the protocol, 1 point is given each time one of the 18 positive items is checked, and 1 point is subtracted each time one of the 12 negative items is checked. The theoretical range of scores is therefore from –12 to +18. A higher score indicates greater creativity. To empirically examine this relationship, we apply a regression framework 3:

$$Y_i = a + b \times creativity_i + \epsilon_i \tag{3}$$

The dependent variable Y_i comprises metrics including sender i's honesty rate, trust rate under both RU and RI conditions, and payoffs across four distinct role categories ((Sender, RU), (Sender RI), (Receiver, RU), (Receiver, RI)).

Table 9 presents the outcomes of the regression analysis. The presence of statistically insignificant coefficients across all outcomes implies that creativity, particularly when measured through self-report assessments, does not demonstrate a notable impact on the rates of truth-telling, trust, or the resulting payoffs within the experimental framework.

Result 7: There is no observed influence of self-reported creativity on the rates of truth-telling, trust, or the subsequent payoffs.

	Dependent variable:						
	honesty	trust RU	trust RI	SProfit RU	SProfit RI	RProfit RU	RProfit RI
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
creativity	0.080	0.017	0.014	-0.027	-0.047	-0.027	-0.010
	(0.118)	(0.130)	(0.120)	(0.037)	(0.034)	(0.032)	(0.033)
Constant	7.361***	7.868***	7.846***	5.699***	5.771***	7.196***	7.067***
	(0.507)	(0.561)	(0.515)	(0.159)	(0.147)	(0.139)	(0.142)
Observations	62	62	62	62	62	62	62
R^2	0.008	0.0003	0.0002	0.009	0.031	0.012	0.001
Adjusted R^2	-0.009	-0.016	-0.016	-0.008	0.015	-0.005	-0.015
Note:							*p<0.1; **p<0.05; ***p<0.01

Table 9: Creativity Results

6 A Calibrated Utility Function

We calibrate the senders' utility function to better understand their behavior. We formulate the senders' utility function by incorporating their reluctance to lie:

$$u_S(f(d), a, c(\omega, m; \theta)) = (n_I - c_I)\mathbb{1}_{d=1} + h\mathbb{1}_{a=\omega_H} - l\mathbb{1}_{a=\omega_L} - c_\theta \mathbb{1}_{m\neq\omega}$$

.

The monetary payoff and the cost of lying remain the same as before. But now, beyond the discovering cost c_θ, there is a fixed benefit of knowing whether it is necessary to lie n_I by getting informed of the truth. The fact that the vast majority of the senders uncover the truth suggests that the net value from discovering the truth is positive, i.e., $n_I - c_I \geq 0$ for the majority of people. In that case, there are babbling equilibrium, truth telling, and partial lying equilibrium.

This utility function could also explain the fast and slow patterns based on the drift diffusion model. The drift diffusion model claims that the larger the difference of the choices, the faster the decision. From now on, we assume that the sender chooses to discover the truth, and the receiver trusts any message from the sender with a positive probability $p > 0$, which explains 83% of the data[1].

Let's first compare the genuine y and the genuine n reports. Given a *yes* state, the difference between reporting y and n is $D_1 = pz + c_\theta > 0$. For any realization of c_θ, the sender would always report y. Given a *no* state, the difference between reporting y and n

[1]Senders uncovered the truth 92% of the time, and receivers trusted each message with positive probability 90% of the time.

is $D_2 = pz - c_\theta$. The sender would report y if $pz > c_\theta$, and otherwise n. No matter what the sender decides to do, the absolute value of D_2 is smaller than D_1. Therefore, both the deceptive y and the genuine n are slower than the genuine y.

7 Conclusion

We study what private information RT carries and its strategic use in a sender-receiver game with conflict of interest and with a truth discovery process. We found that the vast majority of people discovers the truth before deciding to lie or to tell the truth. It implies that RT does not reveal if the sender uncovers the truth. Given such strong preference of getting informed of the truth, we have found that for the informed messages with a conflict of interest, the longer the message, the higher probability of deceit. However, receivers did not use it effectively. When receives had better trust more relative short messages, they did trust more long messages. We also found that senders were able to successfully manipulate their RT to their best interests, and availability of RT did not change their honesty rate.

These findings suggest that long RT is not an effective cue in detecting lies, which is also easily to be manipulated. Trusting toward the long RT is not an rational decision for receivers. Receivers might be better off if they just ignore the RT and trusting the message more when it's against the sender's interest.

One limitation of our research is that the scale of lying benefit and cost of discovering might be too small to make an big influence in senders' decision. In real life, the benefit of recommending an expensive car might be worth a month's salary and cost of meticulously examining each corner of a house might be equivalent to several hours' pay. Future research could study senders' lying and discovering behavior with a high lying benefit and a high discovery cost. There are also environment when lying is supposed to be costly, and future research could investigate the strategic use of RT in such environment.

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Appendix A: Interfaces

PART I

Part 1 consists of 10 rounds, in which each of you will play the role of a sender. In each round, the computer generates outcomes of 6 dice. The outcome of each die is randomly drawn from the set 1, 2, 3, 4, 5, 6.

We define the outcomes 1, 2, 3 as "small numbers", and 4, 5, 6 as **"large numbers"** .

You can privately learn the outcomes of the 6 dice by clicking the dice buttons on your screen. Each button will uncover the outcome of 1 die, and you can uncover as many as you want. The outcomes of the dice will not change with the total buttons you click to uncover. Then you need to report on the question if there are 4 or more "large numbers" by choosing "Yes" or "No". Your report could be independent from the outcomes of the 6 dice.

Your payment as a sender

Your payment will be based on the Parts 2 and 3 of the experiment. You will be matched with another player, who's a receiver, and his choices will determine your payoff as a sender.

The receiver in Parts 2 and 3 has to answer the same question as in Part 1, without the ability to learn the true outcomes. However, he will receive your report to inform him to guess the answer.

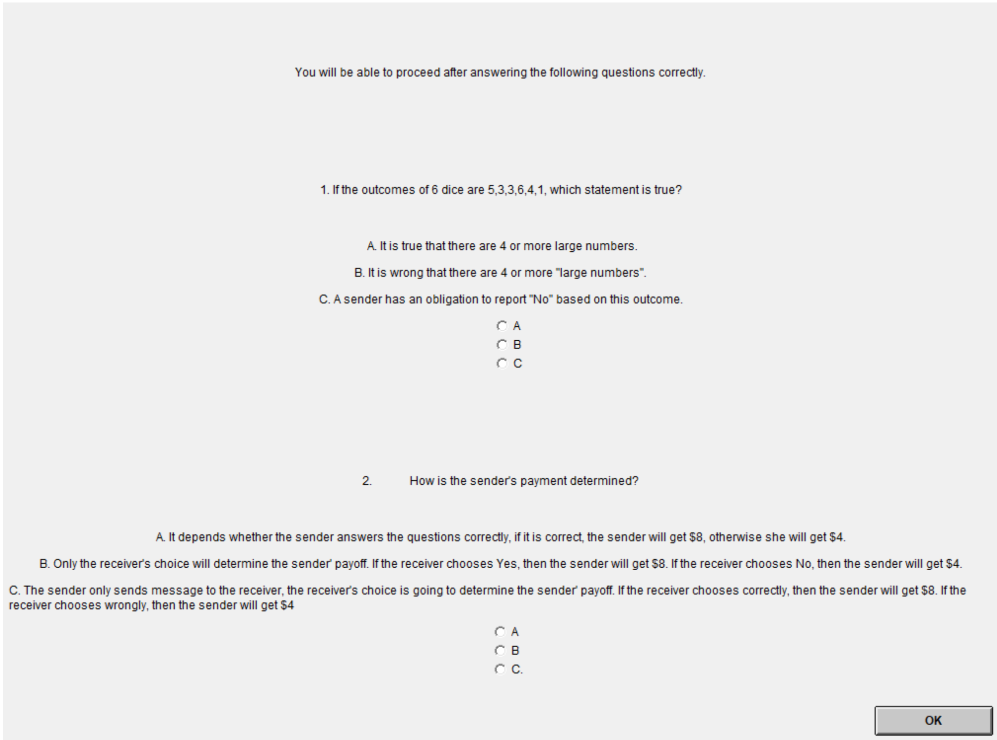
If the receiver chooses **Yes** (there ARE 4 or more "large numbers"), you will get **$8** , regardless of the true answer.

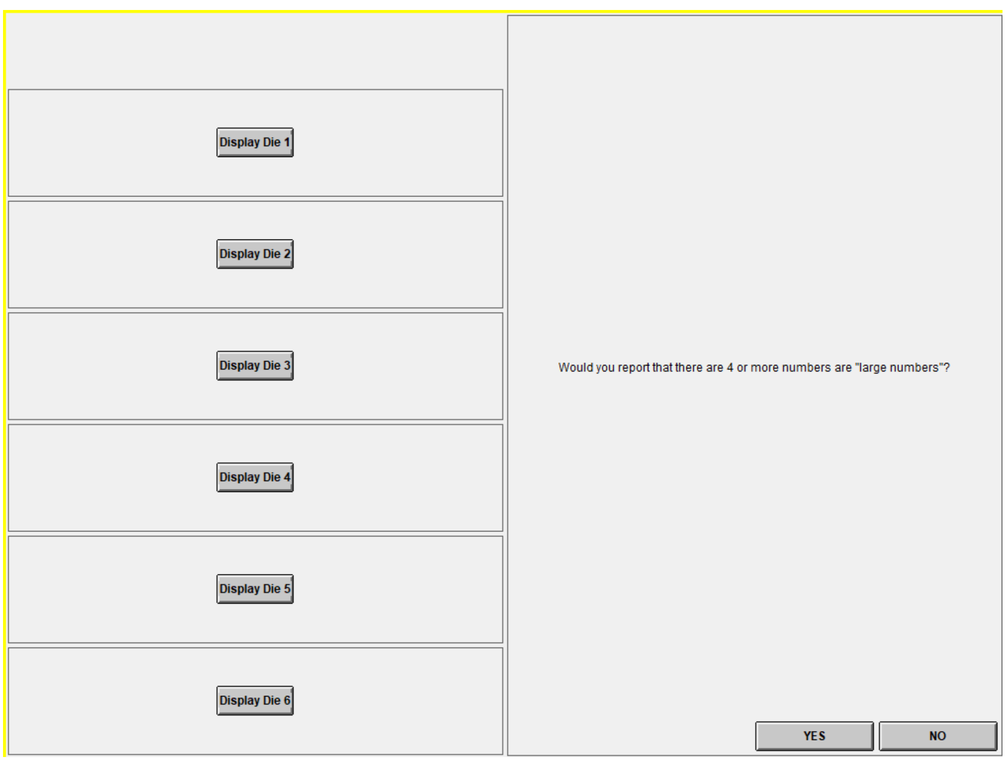
If the receiver chooses **No** (there ARE **NOT** 4 or more "large numbers"), you will get **$4** , regardless of the true answer.

The receiver gets $ 8 if his guess is right, and $4 if his guess is wrong.

If the instructions is clear to you, you may go to the next screen to answer comprehension questions.

OK


You will be able to proceed after answering the following questions correctly.
1. If the outcomes of 6 dice are 5,3,3,6,4,1, which statement is true?
A. It is true that there are 4 or more large numbers.
B. It is wrong that there are 4 or more "large numbers".
C. A sender has an obligation to report "No" based on this outcome.
A
B
C
2. How is the sender's payment determined?
A. It depends whether the sender answers the questions correctly, if it is correct, the sender will get $8, otherwise she will get $4.
B. Only the receiver's choice will determine the sender' payoff. If the receiver chooses Yes, then the sender will get $8. If the receiver chooses No, then the sender will get $4.
C. The sender only sends message to the receiver, the receiver's choice is going to determine the sender' payoff. If the receiver chooses correctly, then the sender will get $8. If the receiver chooses wrongly, then the sender will get $4
A
B
C.
OK


Display Die 1
Display Die 2
Display Die 3
Display Die 4
Display Die 5
Display Die 6
Would you report that there are 4 or more numbers are "large numbers"?
YES
NO

PART II

Now you are a **receiver, who will get 10 reports from a sender in Part 1, one for each round. You'll get reports all at the same time.**

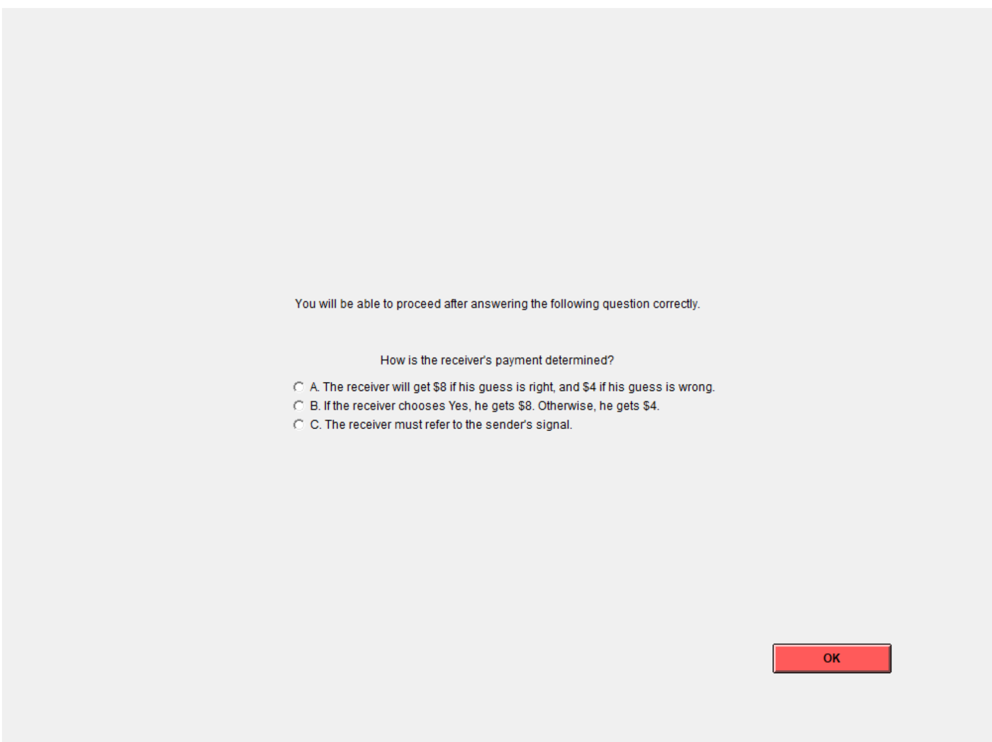
It is up to you whether you would like to refer to the reports from the sender to make your guesses or not. You will need to make 10 guesses on "If there ARE 4 or more 'large numbers' in the 6 dice". Your guess will be either **"Yes"** (there ARE 4 or more "large numbers") or **"No"** (there ARE NOT 4 or more "large numbers").

Your payment as a receiver

For any question, you will get $8 if your guess is right, and $4 if your guess is wrong.

If the instructions is clear to you, you may go to the next screen to answer comprehension questions.

OK

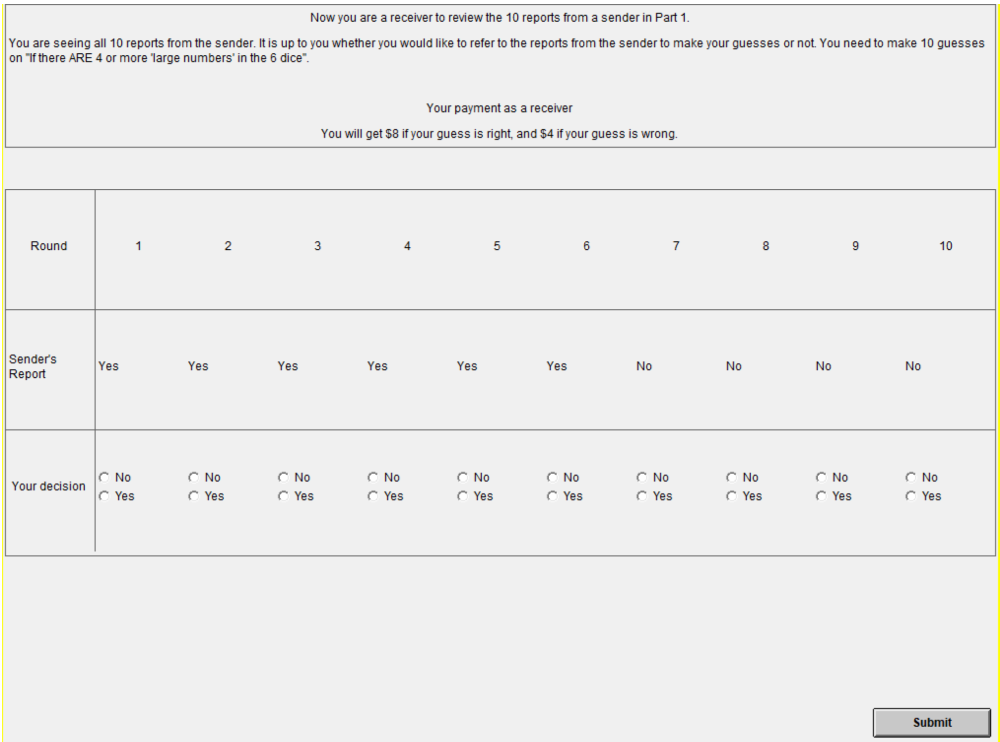


You will be able to proceed after answering the following question correctly.

How is the receiver's payment determined?

- A. The receiver will get $8 if his guess is right, and $4 if his guess is wrong.
- B. If the receiver chooses Yes, he gets $8. Otherwise, he gets $4.
- C. The receiver must refer to the sender's signal.

OK



Now you are a receiver to review the 10 reports from a sender in Part 1.

You are seeing all 10 reports from the sender. It is up to you whether you would like to refer to the reports from the sender to make your guesses or not. You need to make 10 guesses on "If there ARE 4 or more 'large numbers' in the 6 dice".

Your payment as a receiver

You will get $8 if your guess is right, and $4 if your guess is wrong.

Round	1	2	3	4	5	6	7	8	9	10
Sender's Report	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No	No
Your decision	○ No ○ Yes	○ No ○ Yes	○ No ○ Yes	○ No ○ Yes	○ No ○ Yes	○ No ○ Yes	○ No ○ Yes	○ No ○ Yes	○ No ○ Yes	○ No ○ Yes

Submit

PART III

Now, you need to re-make 10 guesses on the questions. But, in addition to the reports from the sender, you will also know the time that the sender used to generate each report.

Your payment as a receiver

Your payment is the same as before. For any question, you will get $8 if your guess is right, and $4 if your guess is wrong.

OK

Now, you need to re-make 10 guesses on the questions. But, in addition to the reports from the sender, you will also know the time that the sender used to generate each report.

You are seeing all 10 reports and the response time from the sender. It is up to you whether you would like to refer to the answers from the sender to make your guesses or not. You need to make 10 guesses on "If there ARE 4 or more 'large numbers' in the 6 dice"

Your payment as a receiver

Your payment is the same as before. You will get $8 if your guess is right, and $4 if your guess is wrong.

Round	1	2	3	4	5	6	7	8	9	10
Response Time (in sec)	1	0	0	1	0	0	0	0	0	0
Sender's Report	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Your decision	◯ No ◯ Yes	◯ No ◯ Yes	◯ No ◯ Yes	◯ No ◯ Yes	◯ No ◯ Yes	◯ No ◯ Yes	◯ No ◯ Yes	◯ No ◯ Yes	◯ No ◯ Yes	◯ No ◯ Yes

Submit

Survey

By completing this survey, you will receive additional $1, which will be added to your total earnings.

1. What's your gender? ◯ Man ◯ Woman ◯ Other

2. Please indicate which of the following adjectives best describe yourself. Check all that apply.

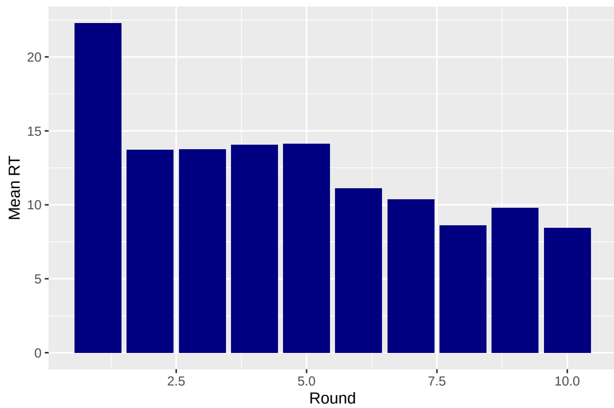
☐ Capable	☐ Egotistical	☐ Conventional
☐ Honest	☐ Original	☐ Self-confident
☐ Artificial	☐ Commonplace	☐ Informal
☐ Intelligent	☐ Narrow interests	☐ Sexy
☐ Clever	☐ Humorous	☐ Dissatisfied
☐ Well-mannered	☐ Reflective	☐ Submissive
☐ Cautious	☐ Conservative	☐ Insightful
☐ Wide interests	☐ Sincere	☐ Snobbish
☐ Confident	☐ Individualistic	☐ Suspicious
☐ Inventive	☐ Resourceful	☐ Unconventional

OK

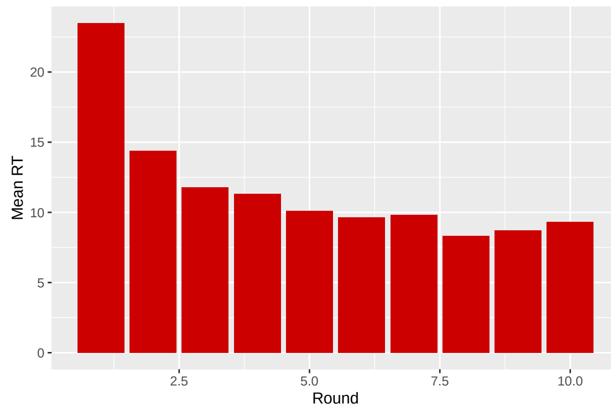
Appendix B: Graphs

B1: Time trend of RT

In both conditions, round 1 took much more RT than the following ones, suggesting that subjects used it as a practice. In round 2-10, the latter rounds took less time than the former rounds.



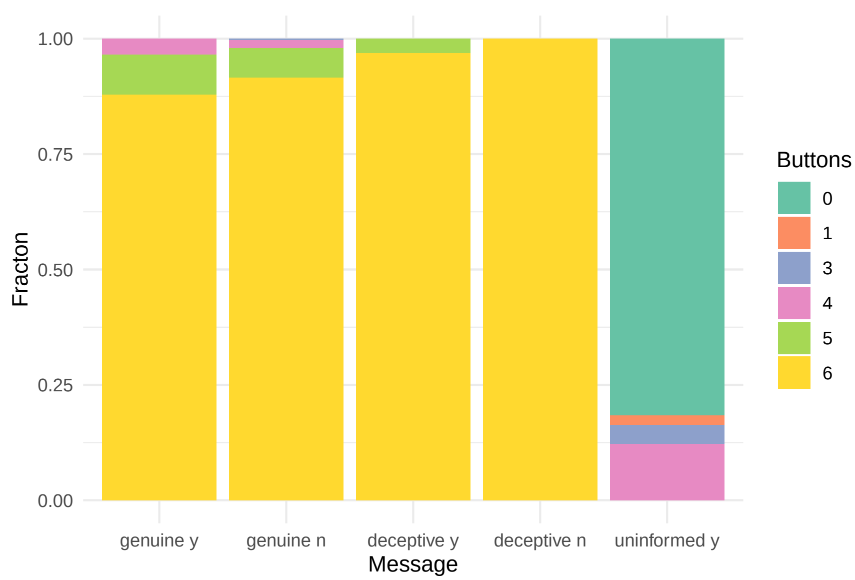
(a) SU condition



(b) SA condition

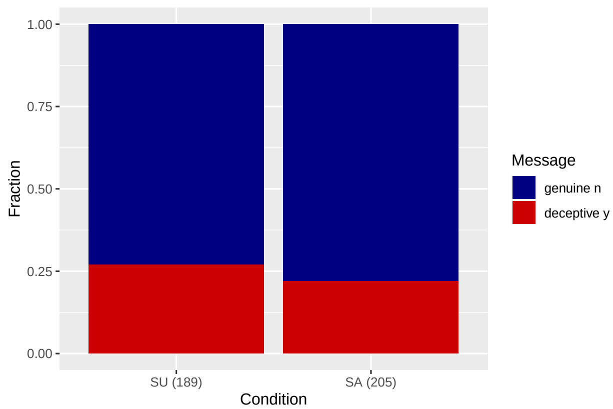
Figure 5: Mean of RT in each round.

B2: Fraction of number of buttons clicked for different messages

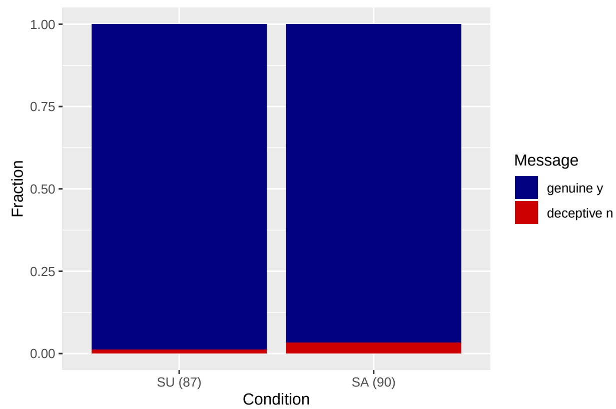


B3: Honesty rate for different states

Figure 6 denotes the honesty rate for each state when the senders uncovered the truth. In the SU condition, given state *no*, the honesty rate was 73%, while the honesty rate was 77% in the SA condition. However, the difference is not significant (p=0.25). Given the state *yes*, the majority of senders told the truth, and the difference between two conditions is not significant (p=0.33).



(a) state *no*



(b) state *yes*

Figure 6: Honesty rate in each state. The number in the parenthesis denotes the number of observations.

Appendix C: Statistics

Table 10 shows that there are no significant differences in senders' payoffs after receivers observed senders' RT for all types of messages.

Message (obs.)	RU	RI	t test
genuine y (86)	\$7.35	\$7.16	p=0.43
deceptive y (51)	\$6.27	\$6.35	p=0.84
genuine n (138)	\$4.46	\$4.38	p=0.56
deceptive n (1)	\$4	\$4	not applicable
uninformed y (24)	\$4.17	\$4.17	p=1

(a) In the SU condition

Message (obs.)	RU	RI	t test
genuine y (87)	\$7.31	\$7.45	p=0.53
deceptive y (160)	\$6.58	\$6.84	p=0.50
genuine n (45)	\$4.35	\$4.50	p=0.28
deceptive n (3)	\$5.33	\$4	p=0.42
uninformed y (25)	\$6.72	\$6.24	p=0.39

(b) in the SA condition

Table 10: Senders' Payoff Comparison

The difference between the genuine y and deceptive y suggests that receivers could somehow identify the deceptive y. No difference between the RU and the RI conditions suggests that receivers did not use the RT to identify the deceptive y. We find that the difference disappears when the count of ys fell below than 7. It suggests that receivers use the total number of ys from the sender to identify the deceptive y, and they did not trust the y from a sender if she sent too many ys.

Message (obs.)	RU	RI	t test
y (161)	\$6.78	\$6.67	p=0.55
n (139)	\$7.51	\$7.60	p=0.57

(a) In the SU condition

Message (obs.)	RU	RI	t test
y (157)	\$6.60	\$6.52	p=0.73
n (163)	\$7.61	\$7.44	p=0.23

(b) in the SA condition

Table 11: Receivers' Payoff Comparison