Where the truth lies: how sampling implications drive deception without lying - A replication study

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Abstract

Communication plays an important role in our day to day life. But effective communication leaves gaps between the message and the meaning of what is said. These gaps can be filled by the interlocutor trying to understand the intention of the other and in this sense filling the gap. To the extent that such meta-inference is not calibrated, communication is compromised, raising the possibility of manipulation for deceptive purposes. We tried to replicate the study by Ransom et. al (2019) "*Where the truth lies: how sampling implications drive deception without lying*" where the findings suggested that these implication and meta inferences hold. We have studied how people think when they act as the target of deception. Deception requires withholding information or providing data that was factually correct but nonetheless misleading. We did not find any evidence that people are suspicious of the reasoning behind the communicative intent.

Keywords: Bayesian Modeling Deception, Meta- Interference

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Methods

Participants

We recruited 46 participants by sharing the link with friends, family and followers over social media to get a relatively good representation of society. The participation was voluntary and not compensated. Every participant only participated once. The age ranges from 19-62 (mean of 31). 2 participants were excluded, as three of their answers were given faster than 700ms and therefore we have to question the reliability of the responses for our purposes. Which left us with the data of 44 participants.

It was quite a challenge to get 100 people to participate in our experiment and due to time issues we decided to finish the collection of the data with 46 participants and that is already enough data to get a reliable representation of the phenomena in our analysis.

Materials

We used pictures that we had created ourselves, that follow the guidelines of the materials shown in Ransom et al. (2019).[1] There are 42 images. 24 of those images are the shown map, and the remaining 18 are evidence maps. The images consist of a 18x18 grid, in which points or areas are marked. In the shown maps, this grid is filled with yellow squares indicating the map space. In the evidence maps, blue dots are placed on the grid. The blue dots on the evidence map are then used by the viewer to choose a shown map. There are three types of evidence maps, uninformative, misleading and helpful maps. They always are true for the “true” shown map.

[1] https://psyarxiv.com/pv5tk/ - 31.08.2021

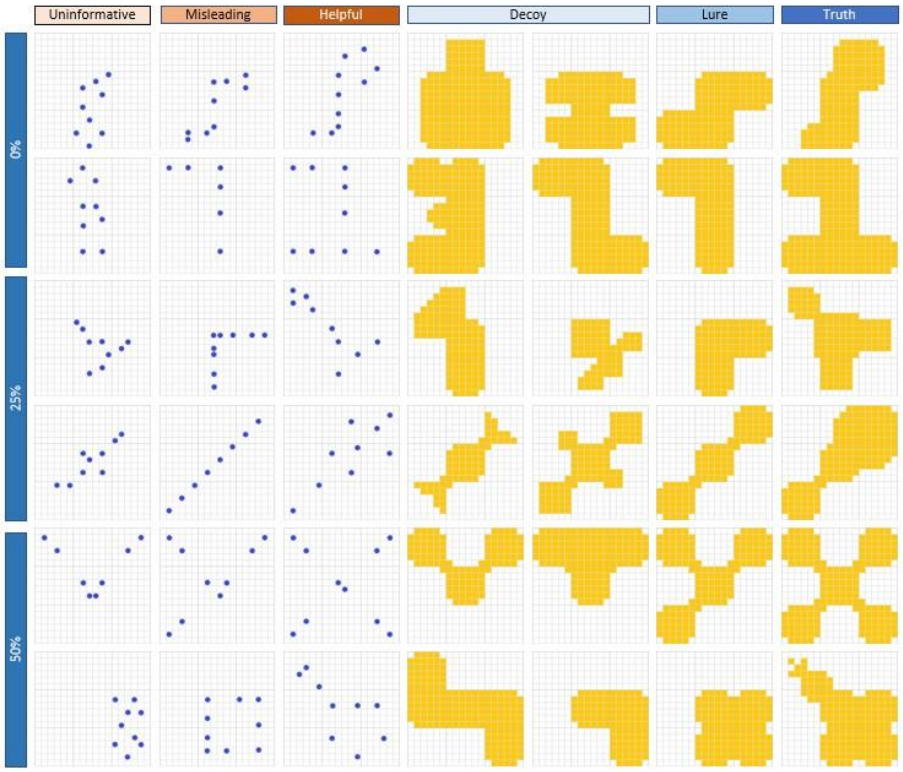

Figure 1: The Experiment stimuli
In both experiments, each trial included one of six sets of stimuli (rows) made up of four maps (yellow regions) and three sets of evidence (blue dots). All four corresponding maps support the Uninformative evidence. Only the Helpful map is consistent with the useful evidence (the Truth). The Misleading evidence is intended to encourage a false conclusion (that the Lure map is genuine), but is also consistent with the Truth.

Also, there are three types of shown maps: decoy, lure and truth. The decoy maps are randomly chosen, but they still fit the uninformative evidence map. The lure maps work together with the misleading evidence map to deceive the participant. The truth map is the map, which is the right option for all the evidence maps, as it is the only one that fits all the different evidence maps. The uninformative maps show dots in a pattern which could be fitting for all maps. The misleading maps are leading to “lure” shown maps, which are used to deceive the participant. The helpful maps are only true for the true shown map. They do not fit on the others. The row labels indicate the percentage of shown maps ruled out by the misleading evidence map.

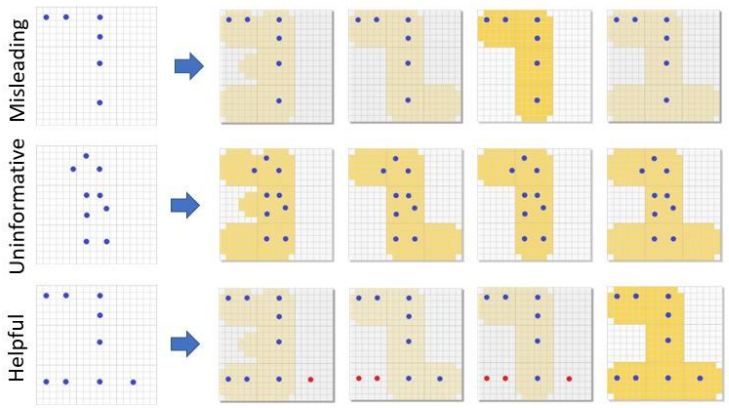

Figure 2: The Deception
The Participants are given three options to choose from: Misleading, Uninformative, or Helpful evidence. As the receiver, the participants attempt to derive the identity of the genuine map based of the evidence provided. Here the brightness of the shaded areas has been varied to illustrate how credible a trusting receiver consider each map after viewing the evidence (brighter maps represent more plausible hypotheses and red dots hint disconfirmatory evidence).

The readers can access our complete materials by sending us an e-mail and we will forward the experimental materials.

Procedure

The experiment consisted of ten parts. We started by showing the participants the general instructions for this experiment. A condition, either teammate or opponent, was chosen via a coin flip, we will refer to this as the chosen condition. Then we showed them the instructions for the chosen condition's practice trial. This included the explanation of both condition groups and the statement, that no false information will be provided. This was followed by the chosen condition's practice trials. These consisted of one evidence map and 4 shown maps that depicted the common hypothesis space. Now, the practice instructions for the other condition were shown. These were basically the same as for the chosen condition. They only differed in the condition

shown. After this, the instructions for the first main trial block were presented. This was followed by 18 stimuli presented for the first main trial. Then the instructions for the second part of the trials were shown. The last part of the experiment was the second main block, which also consisted of 18 stimuli presented for the other condition. We followed this by a quick questionnaire on the participants' age.

Analysis

We used a between-group comparison and *multinomial regression* modeling to analyze the results and to test our hypothesis. We did that using a Bayesian approach.

For the analysis the measured variables of misleading were summarized under one category of evidence. Also, the answers of Decoy1 and Decoy2 were summarized under one category named decoy.

The manipulated, *independent predictor variables* are the condition (teammate/opponent) and the evidence (misleading, uninformative, helpful). The dependent variable is which treasure map is chosen given the evidence and condition, referred to as *response*.

All variables are categorical. ‘Condition’ has two levels and ‘Evidence’ and ‘Response’ both have three levels. As our family is categorical and there are more than two possible outcomes, for our analysis we use a multi-logistic regression model.

We filtered our data such that we only had the important entries “response”, “condition” and “evidence” left. To achieve that we first needed to clean our collected data and only select the mentioned relevant entries for our analysis. Also, we filtered out all participants who were faster than 700ms in three responses, as this suggests that they were probably not working properly on the experiment and we had to question the validity of the rest of the data submitted by them. This

is because we suggest that higher cognitive processes, like reasoning, as well as processing the maps takes longer and we have to leave that time for a behavioral response.[2]

In addition to that we made inference over a directional delta to test our hypotheses, as we claimed that the Lure is chosen more often in the teammate than in the opponent condition, given the misleading evidence. The same goes for the second hypothesis that given the uninformative evidence participants choose the lure more often in the teammate than in the opponent condition. Due to time issues we did not investigate, if there was even a major difference between the two conditions, meaning if there is any suspicion and reason beyond the data. As a reference level for our analysis model we used the condition teammate, misleading and decoy. We did not have to deal with missing data, as participants are just able to get to the next evidence, when they have chosen a category. Otherwise the experiment would not proceed. If a participant did quit the experiment the data was not used since the provided data was not to be submitted.

[2] https://academic.oup.com/brain/article/123/6/1161/441930?login=true - 31.08.2021

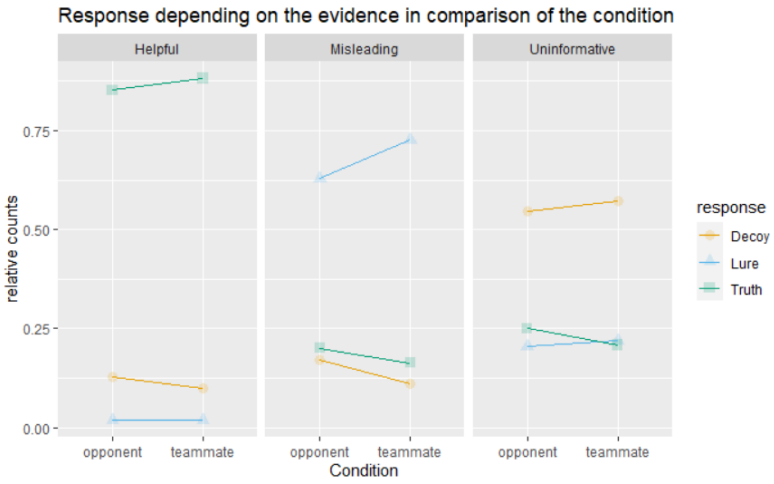

Figure 3: Response
Comparing the response given by the participants in each condition (TEAMMATE, OPPONENT) it shows that if helpful evidence was provided, participants generally chose the Truth map most but more often in the TEAMMATE than in the OPPONENT condition. The Decoy and Lure maps were barely selected under helpful evidence. If misleading evidence was shown, participants chose the Lure ma most but more frequently in the TEAMMATE than in the OPPONENT condition. More participants chose the Decoy and Truth map under the OPPONENT than the TEAMMATE condition. Given uninformative evidence, the Decoy maps were chosen most, more often in the TEAMMATE than the OPPONENT condition. The Truth map was selected more frequently under the OPPONENT and the Lure map more frequently under the TEAMMATE condition. Interestingly, Lure and Truth maps were chosen almost equally often under the TEAMMATE condition.

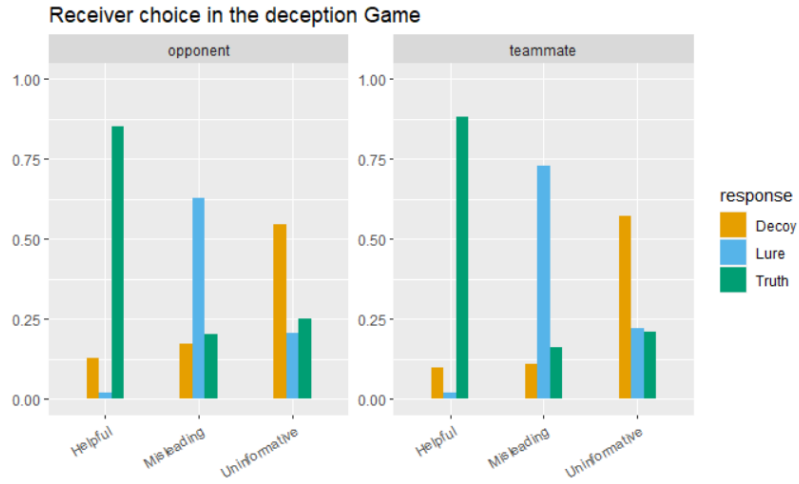

Figure 4: Decision of the Participants
During each trial, the participants selected between two incorrect Decoy items, Lure and the Truth. In the TEAMMATE condition, the participants were told that the evidence had been provided by a helpful teammate; in the OPPONENT condition they were told that it had come from an opponent trying to conceal the truth. It is clear that the participants understood that the Helpful evidence(left-hand-side) was consistent with the Truth(Green)in the Misleading evidence(Middle) the participants were tending towards selecting the Lure(Blue) since the evidence was consistent with both the Lure and the Truth. And in the Uninformative evidence (right-hand-side)more likely to choose Decoy(Orange).

Results

When visualizing our collected data (Figure 3 & 4) we can see that in both conditions, given the helpful evidence, mainly the map displaying the truth was chosen. Given the misleading evidence we can see that the Lure is chosen slightly more often in the teammate than in the opponent condition and that the decoy and truth were chosen not as often and also in a low frequency. Given the uninformative evidence the decoy was chosen the most often in both

conditions. The Lure and Truth map are chosen in similar manner. It would be interesting to investigate, if there is even a major difference between the two conditions. Out of time issues we were not able to make further investigations.

Like mentioned above we used a multinomial regression model to analyse and display the relation between the variables. We also assume an interaction between our independent variables. After sampling the posterior probabilities we were able to calculate the summary statistics with a 95% HDInterval, displayed in the graphic below (Figure 5).

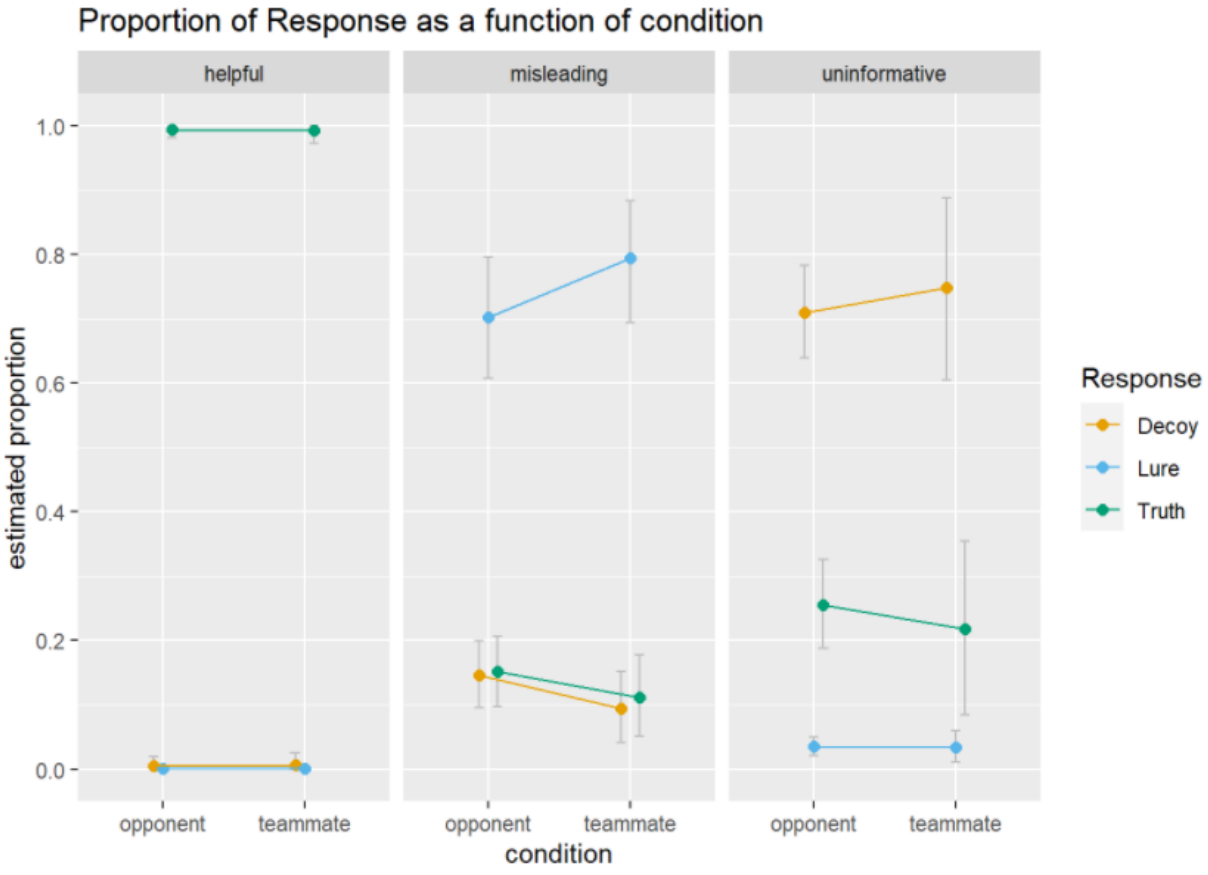

Figure 5: Relative Posterior Probability posterior probabilities with a 95% HDInterval per condition, separated by evidence.

Before we present the results of our tested hypotheses we want to take a look at Figure 3 which already gives us a good idea of how our model behaves and what results we might get. When we compare the responses per evidence for the two conditions, it is visible that the 95% confidence intervals for each condition overlap. So we can already see that we will not have any significant findings in our data. Nonetheless let us proceed to the hypothesis testing.

Out of statistical analysis reasons we adjusted the hypothesis suggested in our first design plan and made them more specific, so that it is easier to test them. Now our hypotheses were: Given the misleading evidence participants choose the lure more often in the opponent than in the teammate condition. The second would be that given the uninformative evidence participants choose the Lure more often in the opponent than in the teammate condition. We solemnly swear that we did not peek at the gathered data before adjusting our hypothesis.

Results for Hypothesis 1: Given the misleading evidence participants choose the Lure more often in the opponent than in the teammate condition.

After testing our first hypothesis we were not able to see support for the hypothesis that when the participants are presented with the misleading evidence they will choose the Lure more often in the opponent than in the teammate condition. With a BF of 20 there was no evidence provided for our hypothesis. Also, the 90% credible Interval for our one sided hypothesis includes zero and therefore we completely reject the first hypothesis.

Results for Hypothesis 2: Given the uninformative evidence participants choose the Lure more often in the opponent than in the teammate condition.

After testing our Hypothesis that when the participants are presented with the uninformative evidence they will choose the Lure more often in the opponent than in the teammate condition we were not able to find support for it. With a BF around 5 and the 90% credible interval including zero we reject our second hypothesis as well.

Discussion

Like already mentioned above, given the evidence provided in our data we were not able to support any of our hypotheses. No evidence was significant enough to be pointed out and not just labeled a mere coincidence. As it did make a difference under which condition the participants chose the map we can make the guess that there was no suspicion on the side of the participants and no significant reasoning behind the evidence provided.

Now this raises the question for us why we were not able to replicate the findings of Ransom et al (2019). This could be, because the finding of Ransom et al was a mere coincidental finding of some data anomaly. On the other hand we have to admit that the number of partaking participants was not the one we aimed for and has not a great power. Therefore it could be that no meaningful effects are discovered. We would have appreciated it if we would have had more time to recruit more participants to get a better representation of a potential phenomena. In the original study the participants got money to partake in the study. First this probably made it easier for them to recruit a lot of participants and second it gave the participants additional pressure to give it their all in the study and pursue the right answers. As for our execution of the study the participants did not have any bonus for answering the questions with precision. Since we were not able to overlook the participants taking part in our study they could have just

clicked on any random map. It is proven that without monitoring performance the results of the participants will be more directionless and aimless, which could have also falsen the results we have got.[3]

We can already say that the topic of suspicion in human interaction and reasoning behind the evidence provided, is a field which may hold many interesting follow-up work and further research, as there is contradictory evidence for or against the phenomena.

One would be to do this study in person. Where the participants would be in the same room and able to see each other. So the participant playing the role of the explorer and the other participant playing the role of the pirate are in one room sitting across from each other. An advantage of this procedure would be that one could read verbal clues which would maybe increase suspicion. This could lead to different results because you have more of a relation to the other participant (you can actually see the human behind the Teammate/Opponent) and are maybe more eager to win. Another trigger to enhance the performance of the participants could be a real-world reward, as other studies have already shown that even a minor reward raises the motivation and enhances performance.[4]

Another reason why suspicion probably did not lead to an enhanced performance in detecting deception is already given in decades of research that have shown that people are poor at detecting lies. The discussion has not brought up entirely clear reasons for this yet. Like Maria Hartwig and Charles F. Bond already investigated in their Study '*Why do lie-catchers fail - A*

[3] https://engageinlearning.com/blog/why-is-monitoring-performance-important/, 31.08.2021
[4] http://selfdeterminationtheory.org/SDT/documents/2002_HoulfortKoestnerJoussemetVivierLekes_MO.pdf - 31.082021

lens model meta analysis of human lie-judgements': "*Two explanations for this finding have been proposed. First, it has been suggested that lie detection is inaccurate because people rely on invalid cues when judging deception. Second, it has been suggested that lack of valid cues to deception limits accuracy."*[5] This was also suggested by DePaulo, who mentions that people can not detect lying as well as lie detectors.[6] A wider discussion that comes into play when talking about deception and the meta-interference of it is the cognitive process behind it. The question of whether lying is more cognitive demanding than telling the truth.[7] This sparks the discussion if this could be used to detect lying and to understand the process of lying which could help in numerous cases, like in criminal work or job interviews or business. The possibility for us to use that knowledge further to the meta interference could be an additional advantage. But the problem is that deception is not characterized by a single cognitive process but rather involves the combination of a variety of basic cognitive processes such as working memory, response monitoring and inhibition. Identifying these processes, modeling their interplay and their modulation by personality and situational factors is still one major challenge in deception research. The study by Suchotzki, K., Verschuere, B., Van Bockstaele, B., Ben-Shakhar, G., & Crombez, G. (2017). "*Lying takes time: A meta-analysis on reaction time measures of deception.*"[8]discusses the cognitive mechanism underlying deception and tries to give a background to the process behind deception and what influences it.

[5] https://pubmed.ncbi.nlm.nih.gov/21707129/ - 31.08.2021
[6] https://www.psychologytoday.com/us/blog/living-single/201305/why-are-we-so-bad-detecting-lies
[7] https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3510470/ , 31.08.2021
[8] https://psycnet.apa.org/record/2017-05734-001 - 31.08.2021

To sum it up, we can say that even if we were not able to replicate the experiment by Ransom et. al. we can not give implicit reasons, why that was the case and that the field of deceptive language and meta-inference in human cognition for sure is one which can spark certain interest.

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