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Title:
Strategies of deception: under-informativity, uninformativity and lies – misleading with different kinds of implicature

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Abstract

Conversation is often cast as a cooperative effort, and some aspects of it, such as implicatures, have been claimed to depend on an assumption of cooperation (Grice, 1989). But any systematic class of inference derived from assumptions of cooperation, such as implicatures could also be, on occasion, used to deceive listeners strategically. Here we explore the extent to which speakers might choose different kinds of implicature triggers in an uncooperative game of communication. Concretely, we present a production study in the form of a cooperative or competitive signalling game with the potential of exploiting three kinds of implicatures, namely exact reading of numeral expressions, scalar implicatures linked to the quantifier *most* and *Ad hoc* scalar implicatures. We find that while the exact interpretation of numerals is used similarly to truth-conditional content, scalar quantifier and *ad hoc* implicatures elicit different strategies. We also observe heterogeneity in individual strategic behaviour. Expecting a distrustful receiver, some participants used high rates of uninformative hints, and equal rates of true and false hints. Other participants used a higher rate of lies and false implicatures, suggesting that they were expecting their interlocutor to infer implicatures as if they came from a cooperative speaker.

Introduction

Grice (1989) famously presents conversation as a cooperative activity in which participants abide by a *cooperative principle*, which binds them to make appropriate contributions to the conversation. From this principle follow more specific maxims such as the first maxim of quantity: “Make your contribution as informative as is required” (Grice, 1989, p. 45). Speakers can exploit the maxims in order to communicate implicit propositions (implicatures) of various types. For example, the speaker can violate the first maxim of quality to communicate a quantity implicature. If I tell you that *I used some of your new shampoo* in a context where it would be relevant and more informative to know
whether I used all of your shampoo, you may infer that the reason why I am violating the first maxim of quantity is that the more informative statement is not true and therefore infer the implicature that I did not use all of your shampoo. The last two decades witnessed a wave of experimental investigation of how different types of quantity implicatures are processed and interpreted; and in harmony with Grice’s account, these investigations have focused on situations where the cooperation and honesty of the speaker is taken for granted. However, conversation also takes place in non-cooperative or competitive situations, where the speaker may be deceptive or uninformative. Politicians are often good examples of unhelpful interlocutors. For instance, consider this evasive answer that Theresa May gave in 2016 when asked whether the UK should have access to the EU single market after Brexit: “What I want to see is the best possible deal for the United Kingdom in trade in goods and services” (Bull, 2016). The use and comprehension of implicatures in non-cooperative settings is a vastly understudied topic. The very few existing comprehension studies on this topic suggest that listeners faced with an uncooperative speaker tend to infer less implicatures than if they are faced with a cooperative speaker (Pryslopska, 2013; Dulcinati & Pouscoulous, 2017; Dulcinati, 2018). Even less work has systematically investigated implicature production in uncooperative contexts. We are aware of only one study (Mol, Verbrugge, and Hendriks, 2005; Verbrugge and Mol, 2008) in which participants played a variant of Mastermind. Players took turns to guess the co-players secret sequence of four colors. After each guess, players reported to their co-players the number of matching colours in correct and incorrect positions. In doing so, the reporting player had to choose descriptions from a predefined list. Reporting players had an incentive to be uninformative or misleading, because they would win if their opponent failed to guess their color sequence correctly after a fixed number of moves. The authors found that some speakers, but not all, tended to select under-informative quantifier expressions. The study presented in this paper is similar in spirit but goes beyond this work in that it explicitly compares production of different kinds of quantity implicatures and it also provides a baseline cooperative condition for comparison. We believe that it is particularly interesting and timely to fill this gap in the literature, firstly because this
method allows us to compare how speakers use explicit and implicit communication strategically, and secondly because it may offer a new perspective on the differences between well studied types of quantity implicatures.

A non-cooperative speaker may differ from a cooperative one in that they may be more likely to deceive or to be uninformative. Although Grice (1989) presents conversation as a cooperative effort, he contemplates both the possibility that speakers may be uninformative by opting out of the cooperative principle or of a maxim in an overt way, for example by saying “I can’t tell you that”, and the possibility that they may be deceitful by covertly violating a maxim. The paramount example of covert violations of maxims is lying, where the liar covertly violates the first maxim of quality (i.e. “Do not say what you believe to be false”; Grice, 1989, p. 46) and intends the audience to remain unaware of the violation. Besides lying, the realm of verbal deception includes falsely implicating.

While to lie, at least according to traditional definitions (Isenberg, 1973; Primoratz, 1984), is to say something that the speaker believes to be false with the intention to deceive; to falsely implicate is to communicate something believed to be false by means of a conversational implicature (Meibauer, 2014). For example, if I said that I used some of your new shampoo when in fact I believe that I used all of it, I could be falsely implicating that I did not use all of your new shampoo. Although there is an ongoing conceptual debate on whether false implicatures should be considered lies (Meibauer, 2005, 2014) or not (Dynel 2011, 2015) here we will treat them as separate for the purposes of experiment design and analysis. We let the data speak about any potential difference between false implicatures and lies. Therefore the phenomena which we expect to observe with possibly different behavioural signatures in our study are uninformativity or Gricean opting out, lies and false implicatures.

Lies are part of what is explicitly communicated, while false implicatures are part of the realm of implicit communication (see Carston, 2002, 2009 and Recanati, 2004 for a review of the
implicit/explicit divide\textsuperscript{1}). This distinction is likely to impact communication in non-cooperative contexts and whether a speaker goes for telling a lie or, merely, conveying a false implicature. We expect that the use of lies and false implicatures might differ in our study because some aspects of implicit communication make it particularly advantageous in non-cooperative contexts. Indeed, implicit communication offers the advantage of plausible deniability (Pinker, Nowak & Lee, 2010): implicatures are cancellable and therefore speakers can deny having intended to communicate them. I can say \textit{I used some of your shampoo} and later claim I did not mean that I did not finish it. Such denial is, of course, impossible if I explicitly stated I did not use all your shampoo. This feature of implicit communication comes in handy when the speaker wants to communicate something that could incur a penalty, such as proposing a bribe or providing false information. According to Reboul (2017) implicit communication also offers another advantage: hearers might endorse information communicated implicitly more easily than explicit content for two reasons. First, hearers are more vigilant towards content the speaker is strongly committed to, and a higher degree of speaker commitment is carried by explicit, not implicit, content (Morency, Oswald & de Saussure, 2008). Second, hearers are less vigilant towards content that is the fruit of their own inferences, which is the case for implicatures but not for asserted content. All these reasons might push a speaker to prefer false implicatures to explicit lying.

Some previous studies that are close to the one we are presenting looked at non-verbal deception in the context of signalling games where signallers have to give non-verbal hints (e.g., images, maps) to a receiver player who has to make choices based on the information provided in the hints. Crucially in some cases the game is competitive and the signaler benefits from the receiver’s wrong choices, which provides motivation to deceive. Signallers can give true hints, false hints, uninformative hints and misleading hints, which like false implicatures consist in conveying a true piece of information which leads the receiver to infer something false. Montague and colleagues (2011) found that their players preferred giving misleading hints rather than false hints. In their game the receiver did not

\textsuperscript{1} We assume here an explicit/implicit divide corresponding to the distinction between Grice’s \textit{what is said} and what is \textit{implicated}. However, see Carston (2002, 2009) and Recanati (2004) for different perspectives.
know whether the signaller was cooperative or competitive and they could choose to check whether the hints were false and calibrate their trust accordingly, which was an incentive for the signaller not to be caught lying as it would have reputation consequences for the rest of the game. In a similar competitive game Ransom, Voorspoels, Perfors and Navarro (2017) gave their participants the options to give to the receiver true, misleading or uninformative visual hints, but not false hints, and they manipulated the signaller’s expectations regarding how suspicious or trustful the receiver would be. Because the receiver did not know whether their signaller was honest or deceitful, the signaller could pretend to be helping the receiver while in fact feeding them false or misleading information. They found that when signallers expected a trustful receiver they were more likely to mislead, whereas when they expected a suspicious receiver they were more likely to be uninformative.

These studies are similar to ours firstly because we also employed a competitive signalling game and secondly because the types of deception they studied use the same fundamental mechanisms as the kinds of verbal deception we are interested in, which are to cause someone to have a false belief (Mahon, 2007) either by communicating something false (i.e. false hints, lies) or by communicating something true (i.e. misleading hints, false implicatures).

One important complication of studying explicit and implicit cases of verbal deception is that while the studies on non-verbal deception that we mentioned could draw a clear distinction between false and misleading hints; drawing a distinction between lies and false implicature is not straightforward. In two studies (Coleman & Kay 1981, Hardin, 2010) where participants were asked to rate a false implicature on a scale that ranged from an utterance being a lie to an utterance not being a lie the average rating was near the middle of the scale. In parallel to these results, studies on the explicit-implicit distinction in comprehension found that lay people are likely to consider implicatures part of what is said under some circumstances (Nicolle & Clark, 1999; Doran, Baker, McNabb, Larson & Ward, 2009; Doran, Ward, Larson, McNabb & Baker, 2012). Doran and colleagues (2012) asked participants to judge whether sentences that could give rise to an implicature were true or false in
light of a fact contradicting the implicature (e.g. judging whether the sentence I used some of your shampoo is true given that I used all of it). They found that participants incorporated scalar implicatures arising from quantifiers such as some and most into the truth conditional meaning of the sentence 32% of the time and implicature arising from cardinal numbers (e.g. I have three cats implicating that I don’t have four) 53% of the time. Thus, different types of implicatures differ in how likely they are to be considered part of explicit communication and therefore in whether they are considered to be lies when used deceptively. Different implicature triggers also differ in how easily they give rise to implicatures (van Tiel, van Miltenburg, Zevakhina & Geurts, 2016). This variability is interesting in and of itself. We wanted to explore it, but we also wanted to ensure that our findings would not be restricted to a single implicature type. We therefore chose to use three different types of implicatures in our study.

We focused on three particularly interesting types of quantity implicatures: implicatures arising from numerals, from the quantifier most and from ad hoc constructions, which can all be viewed as types of scalar implicatures (Hirschberg, 1991; Horn, 1972, 1989; van Rooij & Schulz, 2006). For all of them, the implicature arises from the negation of an alternative utterance containing a stronger term on the same semantic scale. In the case of the quantifier most and numerals, these scales are lexicalised and the upper-bound readings in 1a and 2a for instances come from the negation of the stronger alternative in 1b and 2b respectively. Yet, in the case of ad hoc scalar implicatures there is no pre-established lexical scale and the scale arises from the context. No lexical scale links Laurel to Hardy, thus in 3a the implicature ‘I didn’t buy a present for Hardy’ could only be derived in a context where the pair is particularly salient and buying them both a present would be relevant.

1a. I used most of your shampoo.

1b. I used all of your shampoo

2a. I have three cats.

2b. I have four cats.
3a. I bought a present for Laurel.

3b. I bought a present for Laurel and Hardy.

Implicatures linked to \textit{ad hoc} scales are undoubtedly \textit{particularised} implicatures in Gricean (1989) terms since they can only be intended in a context that makes the \textit{ad hoc} scale relevant. By contrast, both scalar terms and numerals have given rise to much theoretical controversies about whether their upper-bound interpretation is the result of an entirely context-dependent implicature or whether it is part of their semantic or \textit{default} meaning (Levinson, 2000; Geurts, 2010). Some theorists argue that lexicalised scalar implicatures linked to quantifiers are an output of grammar (Chierchia, 2004; Chierchia, Fox & Spector, 2012), while others maintain they result from a pragmatic inference. In the latter camp, some defend they are \textit{particularised} implicatures (like \textit{ad hoc} scalar implicatures) and are derived when prompted by context (Geurts, 2010; Noveck & Sperber, 2007), while others maintain they are \textit{generalised} implicatures and that they arise systematically unless the context blocks them (Horn, 1989) or even by default (Levinson, 2000). The interpretation of numerals is also hotly debated with some theorists claiming that they have a lower-bound or \textit{at least} meaning while the \textit{exact} interpretation is supplied in context via an implicature (e.g., Horn, 1972; Gazdar 1979; Levinson, 2000) and others claiming that the \textit{exact} interpretation of numerals is not an implicature but part of their truth-conditional meaning (Carston, 1998\textsuperscript{2}; Breheny 2008; Geurts 2006; Kennedy 2015). It is therefore unclear whether we should lump lexical quantifier scales with numerals, with \textit{ad hoc} scales or whether these are three entirely distinct categories of implicatures. Empirical evidence has not fully settled the debate either. It provides some fairly clear evidence setting numerals apart from quantifier scalar implicatures. Papafragou and Musolino (2003) and Huang, Spelke and Snedeker (2013) provide convincing evidence that numerals have an exact truth-conditional interpretation (i.e. three means ‘exactly three’) by showing that pre-school children give exact interpretations of numerals despite finding scalar implicatures notoriously difficult (Noveck, 2000; Carston (1998) actually argues that cardinals have an underspecified meaning and that whichever sense they assume in context (i.e. at least, at most or exactly) contributes to the truth conditional meaning of the utterance.)

\textsuperscript{2} Carston (1998) actually argues that cardinals have an underspecified meaning and that whichever sense they assume in context (i.e. at least, at most or exactly) contributes to the truth conditional meaning of the utterance.
In the same vein, Huang and Snedeker (2009) found that while adults process the upper bound meaning of scalar terms such as *some* slower than the literal meaning of the quantifier *all*, they process the *exact* meaning of numerals just as fast; suggesting that the former involves drawing a pragmatic inference while the second does not. The comparison between lexical and *ad hoc* scalar implicatures offers mixed results. Recent experimental evidence suggests that the scalar implicatures linked to quantifiers are derived in the same way as particularised quantity implicatures (see Katsos & Cummins, 2010 for a review). Yet, part of the developmental literature suggests that children have more trouble understanding scalar implicatures with quantifiers than *ad hoc* implicatures (Barner, Brooks & Bale, 2010; Stiller, Goodman & Frank, 2011), while in contrast Katsos (2009) suggests they calculate both types of implicatures to the same extent. Finally, somewhat in opposition to previous studies, Rees & Bott (2018) found lower rate of implicature readings for *ad hoc* expressions than for the quantifier *some* or numerals in a study using a structural priming paradigm. Therefore, despite intensive theoretical and experimental interest in these quantity implicatures for the past decades the layout of numerals, quantifiers and *ad hoc* scales remains quite blurred with empirical findings that do not always align with each other. It is for this reason that studying the behaviour of these three types of implicatures in non-cooperative contexts is particularly interesting.

Several papers have looked at models of strategic language use in non-cooperative contexts, with special emphasis on the question as to what happens to pragmatic inferences like quantity implicatures when the interests of interlocutors are not fully aligned or even in complete opposition (e.g. Franke, de Jager, and van Rooij, 2012; Asher and Lascarides, 2013; de Jaegher and van Rooij, 2014). An interesting puzzle which arises in this context is that if the non-cooperativeness of a conversational context is commonly known, a rational interpreter would see through any attempt of a speaker to try to mislead with an implicature: rational conversationalists would therefore neither attempt nor be fooled by a strategically misleading implicature. Franke and van Rooij (2015) discuss how several different assumptions about cognitive limitations of language users can be combined.
with game-theoretic models of implicature generation in such a way that the above mentioned puzzle dissolves. One suggestion is that language users might only have limited capacity to reason about each other’s perspective. There is converging evidence for the view that human reasoners can engage in only a fairly limited number of Theory of Mind reasoning steps in strategic reasoning (e.g. Stahl and Wilson, 1995; Hedden and Zhang, 2002; Keysar, Lin, and Barr, 2003; Crawford and Iriberri, 2007; Camerer, 2003; Meijering et al., 2012). Models of language use that assume possibly limited Theory of Mind reasoning exist (e.g. Benz and van Rooij, 2007; Pavan, 2013; Rothschild, 2013; Franke and Jäger, 2014) and make predictions about human performance in situations of strategic language use (e.g. Degen, Franke, and Jäger, 2013). For example, Franke and Degen (2016) investigated a cooperative game of referential communication and found that most speakers seemed to use exactly one step of Theory of Mind reasoning, a few used none at all (unstrategic play) and even less used two steps of Theory of mind reasoning. When applied to a case of potential scalar implicature use to mislead a listener in an uncooperative context, we might expect that level-0 speakers are completely unstrategic and just produce truthful utterances without considering implicatures or their opponents at all. More sophisticated speakers might assume that their listeners will be regular interpreters without strategic capacity to reason about uncooperative language use. These speakers would therefore likely use implicatures to mislead, possibly in the hope that their listeners would thereby not realize their uncooperative intentions. Finally, if sophisticated speakers are able to reason further they might expect their listeners to see through any attempt of misdirection and so try not to give any information at all, or just use random messages.

In this study we aim to explore how people use explicit and implicit communication in a non-cooperative context. We asked participants to play a signalling game similar to the one employed by Ransom and colleagues (2017) where they had to produce hints for a receiver either in a cooperative or in a competitive scenario. Our game had a number of fundamental differences from the game used by Ransom and colleagues. Firstly, our participants were told that the receiver knew whether the game was cooperative or competitive. This removed the possibility for signallers to pretend that
they were cooperative when their actual goal was to misinform the receiver. This feature of the competitive scenario eliminates the possibility of cooperation and, from a Gricean perspective, should push signallers towards the strategy of opting out and being uninformative. Secondly, in our game participants gave linguistic hints by completing short descriptions. Since these hints are assertions, false hints are lies, in the traditional sense, and the misleading hints give rise to false implicatures. Thirdly, the description templates that signallers completed constrained their hints into pre-determined categories. Half of the description templates pushed participants to convey the hint explicitly and half of them through an implicature – belonging to one of three types: linked to the use of numerals, to the quantifier most or ad hoc scalar implicatures.

**Methods**

**Materials and design**

The game used in this paradigm is a signalling game with two players. Each round of the game has two cards such as the cards in *Figure 1*: a ‘winning’ card and a ‘losing’ card. The signaller knows which one is the winning card and they have to describe it. The receiver sees the same two cards but does not know which one is the winning card. The receiver has to decide which one is the winning card with the help of the description made by the sender.

*Figure 1* winning card and losing card associated to the template description “On the winning card all of the objects are ____”

Participants in our experiment only played the role of the describer, while the receiver player was a virtual player. Participants were not told that the receiver was not a real person. Participants were
assigned to one of two conditions: a cooperative condition or a competitive condition. In the cooperative condition participants were asked to help the receiver find as many winning cards as possible (a game of pure cooperation, in game theoretic terms), while in the competitive condition their goal was to make the receiver click on as many losing cards as possible (a so-called zero sum game).

Materials included in total 36 items (Appendix A), which corresponded to 36 rounds of the game: 18 experimental items and 18 control items. Each item consisted of a template description and the two cards: the winning card, marked by a green outline, and the losing card, marked by a red outline (see Figure 1). Rather than write the whole description of the winning card, participants were asked to complete a pre-made description with a single word (e.g. see template description for Figure 1). All items were constructed in such a way that they had two obvious completions, referring either to the shape or the colour of the objects displayed in the cards (green vs. pink and rockets vs. umbrellas in the example in Figure 1). Control items used description templates containing the quantifiers all or none and their most obvious completions lead to a true assertion or a false assertion about the winning card. Experimental items used descriptions that could give rise to three types of quantity implicatures: exact interpretation of numerals, scalar implicatures associated with the quantifier most or ad hoc scalar implicatures. Experimental items were constructed in such a way that one of the two most accessible completions resulted in a true assertion giving rise to a true implicature while the other most obvious completion produced a true description giving rise to a false implicature. Within each category of items, control and experimental, we counterbalanced whether it was mentioning the colour or the shape of the object that gave rise to the false assertion for control items or to the false implicature for experimental items. The false assertions and false implicatures in each item were false of the winning card but true of the losing card, so that they could be used to deceive the guesser into thinking that the losing card was actually the winning card.

Table 1 provides examples for each category of items.
Table 1 Examples of each category of items

<table>
<thead>
<tr>
<th>Item Type</th>
<th>Description</th>
<th>True completion</th>
<th>False completion</th>
<th>Cards</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control (All)</td>
<td>On the winning card all of the objects are ___</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control (None)</td>
<td>On the winning card none of the objects are ___</td>
<td>blue green</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Experimental (Numeral)</td>
<td>On the winning card two of the objects are ___</td>
<td>blue mugs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Experimental (Most)</td>
<td>On the winning card most of the objects are ___</td>
<td>lamps yellow</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Experimental (Ad hoc)</td>
<td>On the winning card the objects in the middle row are ___</td>
<td>green apples</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Participants and Procedure

We recruited 103 native English speakers (66 females, Mean Age = 28.73) from the online crowdsourcing website prolific.co.uk and directed them to a Qualtrics website where our experiment was hosted. Participants were told that they would play a game where they would have to complete descriptions with one word. Since the task required normal colour vision we tested participants using two plates from the Ishihara colour-blindness test (Ishihara, 1917) and participants who failed the test were prevented from continuing the experiment. Each participant was randomly assigned to either a cooperative or a competitive condition in a between-subjects design. Participants in both conditions were told that the other player scored points by clicking on winning cards and that in each round he or she would read their description and use it to decide which card to click on. Participants were not told whether the receiver would see the score for each
round during the game, which would allow the receiver to see if the describer was attempting to deceive. Participants in the cooperative condition were told that they themselves would score points when the guesser clicked on a winning card. Consequently, their goal was to help the guesser. Instead, participants in the competitive condition were told that they would score points when the guesser clicked on the losing cards. Consequently, their goal was to make the guesser lose. Participants in the competitive condition were explicitly told that the other player knew that the person writing the descriptions was playing against them and vice versa for participants in the cooperative condition. This was to ensure that participants in the competitive condition knew that they could not pretend to be cooperative as the other player would expect them to be uncooperative. Making participants aware that their co-player should know about the non-cooperative nature of the game makes for a more interesting situation than not making them aware, because in this way, if players are rational and believe in (approximately) common belief in rationality, they should see that their best strategy is to be completely uninformative, and they should expect to be able to make their co-player choose the winning card in only about 50% of the cases.

Participants in both conditions were told that the other player did not know that they were completing the descriptions instead of writing them freely. This was to prevent participants from anticipating that the other player would think that the reason why they had not uttered a more informative description in experimental items was because the game prevented them, which would effectively block the derivation of quantity implicatures.

Participants in both conditions were told that they must complete the descriptions with only one word and they were explicitly told that they were allowed to lie. Before allowing participants to perform the actual task of the experiment we asked them four multiple choice questions to check their understanding of the game and we prevented participants who answered incorrectly to any of the four questions from continuing. Instructions for both conditions and control questions are reported in Appendix B.
Each participant saw all of the 36 items divided into two randomized blocks. Participants were not given feedback on the choices of the receiver as they believed that the receiver would play the game in a second phase. After the last item participants were asked to predict their performance and estimate on an 11-point scale ranging from 0% to 100% which percentage of rounds the guesser who would read their descriptions would click on the winning card.

**Results**

Descriptions were automatically coded using an R script which classified each entry according to a predefined list of response types for each item. The list was constructed *a priori* and then adjusted after inspection of the data to accommodate spelling variants and unforeseen strategies. Two-word entries, which were explicitly forbidden in the instructions, were excluded from the analysis. Because of a counterbalancing error we excluded two out of the six *ad Hoc* items from the analysis.

We categorised each description in one of four categories: *true* and *false*, which corresponded to the two most obvious completions that we anticipated (see Table 1), as well as *uninformative* and *other*. We classified as uninformative those descriptions which could either apply to both the winning card and the losing card or to neither. For example, an uninformative response for the all control item in Table 1 was “On the winning card all of the objects are quaint”, and for the none control items in which both cards contain helicopters “On the winning card none of the objects are helicopters”. We classified as other descriptions that attempted to describe only one card but not through the two obvious completions we expected. These descriptions mainly fell in one of two categories of alternative strategies. One strategy consisted in mentioning an object associated only with one card even though this resulted in a statement that was false of both cards. An example of this strategy for the most item in Table 1 was “On the winning card most of the objects are telephones”, which refers to the winning card where telephones are present even though most of the objects are lamps. The other alternative strategy consisted in making reference to whether the objects singled out by the description were the same or different from the other objects in the card and relying on the preferred reading of the statement as referring to the shape of the objects rather than the colour.
An example of this strategy for the *ad hoc* item in Table 1 was “On the winning card the objects in the middle row are identical”. Because the amount of data in these two categories was relatively small we decided to group them together under the category of *other strategies* for the purpose of our analysis.

In the cooperative condition (Figure 2) we found that participants had an overwhelming preference for true descriptions in both types of control items (*all* and *none* items) and in items containing numerals. In the *most* and *ad hoc* items participants had a preference for true descriptions but they also gave a considerable number of false descriptions. *Most* and particularly *ad hoc* items also differed from the other item categories because of the high rate of *other* responses given by participants: 12% of the responses for *most* items and 30% for *ad hoc* items. In the final predicted performance question, in which participants estimated the performance of the receiver using their instructions (i.e. on what percentage of rounds the receiver would click on the winning card), participants in the cooperative condition on average estimated that the receiver would click on the winning card 78.15% of the time.

![Figure 2: Proportion of response types in the cooperative condition](image)

In the competitive condition (Figure 3) participants gave mostly equal numbers of true and false descriptions for all types of items. Participants also gave a considerable amount of uninformative descriptions in control items and items with numerals. The rate of uninformative descriptions was
lower for most and ad hoc Items. Most and ad hoc items also exhibited a higher rate of other responses than other item categories but not as large as in the cooperative condition. In the predicted performance question participants in the competitive condition estimated that the receiver would click on the winning card 49.82% of the time, which was a significantly lower estimate than the one given by participants in the cooperative condition (t(98.81) = -8.351, p<0.001).

<table>
<thead>
<tr>
<th>Item Type</th>
<th>True</th>
<th>False</th>
<th>Uninformative</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>37%</td>
<td>41%</td>
<td>22%</td>
<td></td>
</tr>
<tr>
<td>Numerals</td>
<td>32%</td>
<td>34%</td>
<td>33%</td>
<td></td>
</tr>
<tr>
<td>Most</td>
<td>40%</td>
<td>47%</td>
<td>6% 7%</td>
<td></td>
</tr>
<tr>
<td>Ad Hoc</td>
<td>37%</td>
<td>51%</td>
<td>10%</td>
<td></td>
</tr>
</tbody>
</table>

**Figure 3** Proportions of response types in the competitive condition

We analysed the data by running three binomial regression models. Each model regresses a different outcome variable on the same predictors: condition, item type and their interaction. Item type is a four-level dummy coded categorical predictor with control items as the reference level. Condition is a two-level dummy coded categorical predictor with the competitive condition as the reference level. Therefore, the simple effect of the cooperative condition represents the difference between conditions for control items; the simple effects of Numerals, Most and ad hoc represent their difference from control items in the competitive condition, and their interactions with condition factor express how their difference from the control items changes in the cooperative condition. Therefore, in all three models control items represent a baseline against which the effects of each category of experimental items is compared.

Model 1 addresses the question of what factors affect the preference for a false description over a true description and the outcome variable was a binary variable where true descriptions were coded
as 0 and false descriptions were coded as 1. The details of the analysis are summarised in Table 2. The three types of experimental items are not significantly different from control items in the competitive condition. The negative effect of the cooperative condition indicates that participants were less likely to give false descriptions for control items in the cooperative condition compared to the competitive condition. The significant interactions of most and ad hoc indicate that the difference between these items from the control items in the cooperative condition is different from their difference in the competitive condition. We do not find evidence that this was the case for numerals.

Table 2. Model 1 - Predicting the choice for a false description over a true description

<table>
<thead>
<tr>
<th></th>
<th>B</th>
<th>S.E.</th>
<th>Z</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>(intercept)</td>
<td>0.08</td>
<td>0.07</td>
<td>1.14</td>
<td>.254</td>
</tr>
<tr>
<td>Numerals</td>
<td>-0.03</td>
<td>0.15</td>
<td>-0.18</td>
<td>.854</td>
</tr>
<tr>
<td>Most</td>
<td>0.07</td>
<td>0.14</td>
<td>0.50</td>
<td>.613</td>
</tr>
<tr>
<td>Ad Hoc</td>
<td>0.24</td>
<td>0.16</td>
<td>1.48</td>
<td>.139</td>
</tr>
<tr>
<td>Cooperative</td>
<td>-4.22</td>
<td>0.29</td>
<td>-14.62</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Numerals*Cooperative</td>
<td>0.39</td>
<td>0.52</td>
<td>0.74</td>
<td>.459</td>
</tr>
<tr>
<td>Most*Cooperative</td>
<td>3.32</td>
<td>0.34</td>
<td>9.77</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Ad Hoc*Cooperative</td>
<td>3.19</td>
<td>0.37</td>
<td>8.53</td>
<td>&lt;.001</td>
</tr>
</tbody>
</table>

Model 2 addresses the question of what factors affect the preference for an uninformative description over all other types of descriptions (true, false and other) and the outcome variable is a binary variable where uninformative descriptions were coded as 1 and all other responses were coded as 0. The details of the analysis are summarised in Table 3. The negative simple effect of the cooperative condition indicates that participants were less likely to give uninformative descriptions for control items in the cooperative condition compared to the competitive condition. The negative simple effects of most and ad hoc indicate that participants were less likely to give uninformative descriptions for these items compared to control items in the competitive condition. On the contrary, the positive simple effect of numerals indicates that participants were more likely to give uninformative descriptions for these items compared to controls in the competitive condition. The significant interaction indicates that the difference between ad hoc items and control items is...
different in the cooperative condition compared to the competitive condition. In fact, while the rates of uninformative descriptions for control items and ad hoc items is roughly the same in the cooperative condition (i.e. 2%), they are considerably different in the competitive condition.

Table 3. Model 2 - Predicting the choice of an uninformative description

<table>
<thead>
<tr>
<th></th>
<th>B</th>
<th>S.E.</th>
<th>Z</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>(intercept)</td>
<td>-1.27</td>
<td>0.08</td>
<td>-16.68</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>Numerals</td>
<td>0.55</td>
<td>0.14</td>
<td>3.96</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>Most</td>
<td>-1.49</td>
<td>0.24</td>
<td>-6.14</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>Ad Hoc</td>
<td>-2.32</td>
<td>0.42</td>
<td>-5.52</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>Cooperative</td>
<td>-2.40</td>
<td>0.23</td>
<td>-10.27</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>Numerals*Cooperative</td>
<td>0.17</td>
<td>0.38</td>
<td>0.45</td>
<td>0.655434</td>
</tr>
<tr>
<td>Most*Cooperative</td>
<td>0.22</td>
<td>0.78</td>
<td>0.28</td>
<td>0.779232</td>
</tr>
<tr>
<td>Ad Hoc*Cooperative</td>
<td>2.39</td>
<td>0.66</td>
<td>3.64</td>
<td>&lt; .001</td>
</tr>
</tbody>
</table>

Model 3 addresses the question of what factors pushed participants to resort to other descriptions instead of giving true, false or uninformative descriptions. The outcome variable for this model was a binary variable where other descriptions were coded as 1 and all other responses were coded as 0. The details of the analysis are summarised in Table 4. The only significant effects are the simple positive effects of most and ad hoc, which indicate that participants were more likely to give other descriptions to these items than to control items in the competitive condition. The fact that their interactions are not significant means that we have no evidence that this trend was any different in the cooperative condition.

Table 4. Model 3 - Predicting the choice of ‘other’ descriptions

<table>
<thead>
<tr>
<th></th>
<th>B</th>
<th>S.E.</th>
<th>Z</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>(intercept)</td>
<td>-6.915</td>
<td>1</td>
<td>-6.911</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>Numerals</td>
<td>1.797</td>
<td>1.226</td>
<td>1.465</td>
<td>0.143</td>
</tr>
<tr>
<td>Most</td>
<td>4.35</td>
<td>1.023</td>
<td>4.253</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>Ad Hoc</td>
<td>4.747</td>
<td>1.024</td>
<td>4.634</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>Cooperative</td>
<td>-13.651</td>
<td>609.583</td>
<td>0.022</td>
<td>0.982</td>
</tr>
<tr>
<td>Numerals*Cooperative</td>
<td>-1.797</td>
<td>1219.166</td>
<td>-0.001</td>
<td>0.999</td>
</tr>
<tr>
<td>Most*Cooperative</td>
<td>14.262</td>
<td>609.58</td>
<td>0.02</td>
<td>0.981</td>
</tr>
<tr>
<td>Ad Hoc*Cooperative</td>
<td>14.962</td>
<td>609.58</td>
<td>0.02</td>
<td>0.98</td>
</tr>
</tbody>
</table>

Although the overall proportions of true and false descriptions in the competitive condition seem roughly equal for each category of items (see Figure 3), we found that these overall proportions
were the result of different, sometimes opposed, individual strategies. For example, some participants consistently gave false descriptions while others consistently gave true descriptions, and we found that these strategies were reflected in the performance predictions that participants gave about the receiver who would read their descriptions. For this reason we performed a clustering analysis on the participants in the competitive condition in order to find out whether these individual strategies could be classified under a number of meaningful strategy profiles. We performed k-means clustering analysis in R using four variables for each participant: overall proportion of true descriptions, overall proportion of false descriptions, overall proportion of uninformative descriptions and expected performance of the receiver. Using the average silhouette methodology (Rousseeuw, 1987), which allows to visually compare the quality of different clustering solutions in terms of tightness and separation of the clusters in each solution, we determined that the clustering solution that best summarised the data was a three-cluster solution. The three clusters are summarised in Table 5 which reports each cluster’s average values of the four variables we used in the analysis (i.e. expected performance, overall proportions of true, false and uninformative descriptions; in the table as clustering variables) together with each cluster’s average proportions of description types for each category of items. Figure 4 provides a visual representation of the clusters on the dimensions of percentage of uninformative description and percentage of false descriptions.

Table 5. Clustering variables and proportions of response types for each item category by clustering groups for participants in the competitive condition

<table>
<thead>
<tr>
<th>Cluster and size</th>
<th>Item type</th>
<th>Response type</th>
<th>Performance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>True</td>
<td>False</td>
</tr>
<tr>
<td>Cluster 1 N 18</td>
<td>Clustering var.</td>
<td>59%</td>
<td>17%</td>
</tr>
<tr>
<td></td>
<td>Control</td>
<td>74%</td>
<td>07%</td>
</tr>
<tr>
<td></td>
<td>Numeral</td>
<td>55%</td>
<td>03%</td>
</tr>
<tr>
<td></td>
<td>Most</td>
<td>48%</td>
<td>49%</td>
</tr>
<tr>
<td></td>
<td>Ad Hoc</td>
<td>49%</td>
<td>42%</td>
</tr>
</tbody>
</table>
Cluster 2
N 32
Clustering var.
Control 21% 66% 13% 0%
Numeral 24% 54% 22% 0%
Most 37% 51% 3% 9%
Ad Hoc 31% 55% 2% 12%

Cluster 3
N 6
Clustering var.
Control 16% 6% 79% 0%
Numeral 6% 19% 75% 0%
Most 31% 19% 33% 17%
Ad Hoc 21% 50% 12% 17%

Figure 4
Visual representation of the three clusters

Cluster 1 is characterised by a high rate of true descriptions and a high expected success rate (performance) of the receiver. Participants in this cluster seem to be playing the game as if their goal was to help the receiver. Cluster 2, the most numerous, is characterised by a high rate of false descriptions and by the lowest expected performance of the three clusters. Participants in this cluster were mostly lying or falsely implicating and they expected their strategy to cause the receiver to perform worse than chance. In other words, those who believed to perform well as deceptive senders (and better than chance) are exactly those who used misleading implicatures. Cluster 3 is characterised by the highest rate of uninformative descriptions and an expected performance near 0%.
chance. Although the rate of uninformative descriptions that these participants gave for most and ad hoc items is still relatively high compared to the other clusters it is lower than for Control items and Numerals as participants seem to rely more on other strategies and on true and false responses.

Discussion

Our participants played a signalling game in which they were either helping or competing against a receiver. Their task was to complete descriptions that could help the receiver choose the winning card out of each pair of cards. Some items pushed signallers to convey this hint via assertion and others via implicature (numerals, most, and ad hoc). We categorised the hints used by participants into four types. True hints, which could be either true assertions or true implicatures, false hints, uninformative hints and other, where participants used ways of referring to one of the cards that we had not anticipate. The items were constructed in such a way that the descriptions we anticipated were the obvious completions for the description templates, therefore we found it interesting that participants resorted to other strategies for completing the descriptions.

In the cooperative condition participants overwhelmingly chose true completions for the control items and the items containing numerals, with very few uninformative or other descriptions. This was expected given that their aim was to help the receiver find the winning card. Participants gave a considerable number of false descriptions for most and ad hoc items in the cooperative condition. This is in contrast to the goal of helping the receiver and the most likely explanation for the high rate of false descriptions is that in some cases the potential implicatures of the descriptions were not available to participants and they randomly chose between the two most obvious completions. This is, however, not entirely unexpected, since also in the study of Franke & Degen (2016) on cooperative reference games a number of participants were clearly best characterized as literal speakers who just seemed to produce a random true description as if oblivious to strategic considerations and potential implicatures. Furthermore, most and especially ad hoc items elicited a considerable rate of other descriptions. One possible explanation is that participants anticipated the potential implicatures in these items and preferred to choose other strategies for communicating
the key information in the description rather than trust implicit communication, which some have argued to be a relatively unreliable channel (Reboul, 2017). An alternative explanation, which is also consistent with the high rate of false descriptions, is that this behaviour is also caused by participants not seeing the potential implicatures of the two obvious descriptions, which without the implicatures are simply uninformative for the receiver. And in order to avoid giving an uninformative hint participants may have preferred resorting to other strategies. Previous production studies have investigated situations where speakers needed to communicate information through an inference rather than by asserting it. They found that speakers often, but not always, express themselves in a way that allows the hearer to draw an informative inference. In a study by Davies and Katsos (2010) participants needed to refer to objects in situations where using an unmodified noun would be under-informative (e.g. 'pass me the apple' in a situation where there are two apples) and their adult participants used expressions that allowed the hearer to draw a contrastive inference (e.g. pass me the red apple) almost 80% of the time. Compared to these figures, our participants expressed themselves in a way that would allow a receiver to infer a true inference on 59% for trials for most items and 46% of trials for ad hoc items. On the other hand, there is also a way of rationalizing false and under-informative answers for the most and ad hoc conditions. At least some participants’ choices could have relied on visual focality: the answer categorized by us as ‘false’ mentions the property which uniformly applies to the winning card. For example, in the most condition in Table 1 all the objects on the winning card are yellow. One could speculate that participants chose yellow as a means to coordinate with their co-player based on salience in these cases. Still, these are speculative remarks as the data is not rich enough to disentangle exactly what strategies participants may have used.

The competitive condition differed from the cooperative condition mainly in the rates of false and uninformative descriptions. Participants in this condition were more likely to give false hints (i.e. to lie) in control items: they gave false and true descriptions at roughly the same rate. We also found no evidence that the ratio of false to true descriptions was different for any of the other item types
in the competitive condition. Items containing numerals, like control items, showed a large increase in the rate of false descriptions in the competitive condition compared to the cooperative condition. The relative increase in the rate of false descriptions was significantly smaller for most and ad hoc items as these items elicited a considerable amount of false descriptions in the cooperative condition as well. Participants were also more likely to produce uninformative descriptions for control items compared to the cooperative condition. Items containing numerals also elicited more uninformative descriptions in the competitive condition, in fact they did so even more than control items. For most and ad hoc items the uninformative descriptions were very few and significantly less than in control items. The fact that control items elicited a higher rate of false and uninformative descriptions in the competitive condition suggests that our manipulation had an effect as participants were aiming to cause the receiver to make mistakes either by lying or by being uninformative. The fact that participants relied either on uninformative hints and on equal ratios of true and false hints suggests that they did not expect to be able to cause the receiver to do worse than chance. This is also consistent with participants in the competitive condition indicating that they expected the receiver to click on the winning card roughly 50% of the time. In a similar non-verbal signalling game, Ransom, Voorspoels, Perfors and Navarro (2017) found that when the signaller expected a distrustful receiver, their participants gave uninformative hints roughly 75% of the time and only a few misleading or helpful hints. Although we can assume that our participants were also expecting a distrustful receiver, we found a much lower rate of uninformative hints than Ransom and colleagues. This is most likely due to the fact that while participants in their study could not lie, our participants were allowed to lie and therefore they could take advantage of the fact that receivers would not know if informative hints were true or false. Two studies on implicature comprehension in non-cooperative setting found that participants tended to infer less implicatures from the utterances of a competitive speaker compared to a cooperative speaker (Prylopska, 2013; Dulcinati, 2018). Dulcinati (2018) employed a competitive signalling game very similar to the one used in the present experiment where participants play the role of receiver and knew that the
signaller was allowed to lie. He found that both assertions and implicatures communicated by the signaller were interpreted as false half of the time and true half of the time. Therefore, the expectations of his participants seem to match the behaviour of the signallers in our study, who used true and false hints in roughly equal measure both in assertions and implicatures.

One interesting aspect of the way the three types of experimental items were used by participants is the fact that items containing numerals patterned with control items rather than with the other two categories of implicature items: ad hoc and most. We found no evidence that numerals were used any differently than control items in terms of preference for false descriptions over true descriptions or in terms of the rate of other descriptions in either of the two conditions. In contrast to most and ad hoc items, items containing numerals did not elicit more false hints than control items in the cooperative condition. This suggests that, if the exact interpretation of numerals is an inference, in our study it was as available as the semantic meaning of the quantifiers all and none. Another difference from most and ad hoc items is that items with numerals did not elicit more other responses than control items in the competitive condition; which may be due either to the availability of other strategies for numeral items or due to the motivation to seek alternative strategies for these items. Items with numerals did differ from control items in eliciting more false descriptions in the competitive condition. However, this difference was in the opposite direction from that of most and ad hoc items, which elicited less uninformative descriptions compared to control items in the competitive condition. Overall, this pattern of results indicates that participants used numeral items in a way more comparable to the control items than to the implicature items. In turn, this suggests that the exact interpretation of numerals is part of their truth-conditional meaning meaning (Carston, 1998; Breheny 2008; Geurts 2006; Kennedy 2015) and not an implicature (Horn, 1972; Gazdar, 1979; Levinson, 2000).

As we mentioned, most and ad hoc items were used differently than control and numeral items. They elicited a higher number of false descriptions than controls in the cooperative condition, which may be due to a lower availability of their upper bound interpretation. These items were also less
likely to elicit uninformative descriptions compared to control items in the competitive condition. This may also be attributed to a lower availability of the upper bound interpretation, as the lower bound interpretation of *most* and *ad hoc* description resulted in a description that was just as unhelpful and indeed equivalent to an uninformative answer. In our view, these differences can be attributed to the fact that the key information was conveyed through an assertion in the control and numeral items, but through an implicature in the *most* and *ad hoc* items. On the other hand, the similarity in the way participants used *most* and *ad hoc* items suggests that there was no difference in the way participants computed these two types of implicatures. Our interpretation is therefore in support of the view that lexicalised scalar implicatures linked to quantifiers and those derived from *ad hoc* scales are computed in the same way and therefore are all particularised implicatures (Sperber & Wilson, 1995; Carston, 2002; Breheny, Katsos & Williams, 2006; Geurts, 2010). This conclusion contrasts with theses maintaining that implicatures arising from lexicalised scales are default meanings computed differently from implicatures arising from *ad hoc* scales (e.g. Levinson, 2000; Chierchia, 2004).

Although in the competitive condition the rates of true and false responses are overall equal, our cluster analysis suggests that this is actually the result of different opposing strategies. One tendency was for participants to give more true hints, at least in control and numeral items, and expect the receiver to have a better performance as a result. A bold but simple explanation for why some participants chose this strategy, which is in contrast with their goal in the competitive condition, is that they are literal senders, as modelled by relevant game-theoretic models (e.g. Franke, de Jager, and van Rooij, 2012), where literal senders are players with level-0 Theory of Mind capacity whose behaviour is not affected by their payoff function. This would also be in line with the interpretation of the data from the cooperative condition, where it also seemed reasonable to assume that at least some participants behave like literal speakers. In contrast, the largest group of participants tended to give more false descriptions and they expected the receiver to perform worse than chance as a result. These participants gave a higher rate of false descriptions for control items as well as for
experimental items, suggesting that they were expecting the receiver to draw implicatures from their utterances. Although this is only a numerical observation as there were not enough data to perform meaningful statistical tests on this subgroup of participants, it would be interesting to investigate this preference further. If participants did expect their receiver to draw false implicatures they must have expected the receiver to see them not as opting out but as cooperative enough (in a Gricean sense) to be communicating implicatures. This majority cluster of participants might therefore be related to the majority group of level-1 Theory of Mind language users in the study of Franke & Degen (2016). This would also explain this group’s average judgment of 38% with which they expected the listener to pick the winning card, as these speaker types would expect to be able to outsmart their interlocutors. A third smaller group of participants tended to give more uninformative descriptions. An interesting feature of this strategy is that by giving an uninformative hint participants made the unhelpfulness of their descriptions manifest to the other player. In Gricean terms, while giving false responses might be a case of a covert violation of the maxim of quality, giving uninformative responses may be a case of situational opting out (Dulcinati, 2018) in the sense that it is clear from the situation that the speaker is opting. On one hand, this strategy might be a calculated way of forcing the receiver to choose at random. On the other hand, some participants might prefer to be seen as opting out because they have an aversion to lying. In fact, multiple studies have found that people have an aversion to lying even in economic games where they would benefit from deceiving their interlocutor (Lundquist, Ellingsen, Gribbe & Johannesson, 2009; Gneezy, Rockenbach & Serra-Garcia, 2013). In other words, our participants may have given uninformative hints in order to be honest about the fact that they were being unhelpful. Another potential rationalization of the behaviour of the minority cluster is that they were sophisticated strategic language users who realized a fully unpredictable signalling strategy because they assumed to play against a sophisticated listener. This would likewise also explain the mean 55% with which participants in this cluster expect to be able to make the listener select the winning card. Such high-
level sophistication is rare, similar to the very small number of level-2 Theory of Mind reasoners in the cooperative game of Franke & Degen (2016).

In conclusion, we found that uncooperative speakers tend to be more uninformative and to lie more than if their goal was to help their interlocutor, at least in the kind of competitive situation we set up in our study. Knowing that their interlocutor could be completely distrustful seems to push speakers towards the strategy of telling as many truths as lies, which seems to match the expectations that hearers have (Dulcinati & Pouscoulous, 2017). However, we found that our participants are not uniform in their strategy and a large group of our participants used a higher rate of lies and false implicatures, which suggests that they expected their interlocutors to draw implicatures from their utterances. We hope that further research will find clearer indications as to whether speakers expect their interlocutors to infer implicatures in uncooperative situations. Our results also suggest that the exact interpretation of numeral expressions is part of their truth conditional meaning and that scalar implicatures linked to quantifier and ad hoc scalar implicatures are used and computed in a similar way, suggesting they are both types of particularised implicatures. Further experimental research on the use of implicatures in non-cooperative situations is needed to better understand which factors influence the speakers’ decision to communicate something implicitly or explicitly, as well as the nature of the implicature themselves and the role of cooperation in their derivation.
References


Reboul, A. (2017). Is implicit communication a way to escape epistemic vigilance?. In Assimakopoulos S. (Ed.), *Pragmatics at its Interfaces*, (pp. 91-112). De Gruyter.


Appendix A
### Appendix B

**Instructions for the [cooperative/competitive] condition:**

HOW THE GAME WORKS (please read carefully)

This is a [cooperative/competitive] game with two players: a describer and a guesser.

In this game you are the describer. (the guesser will play in a second phase)

In each round of the game you'll see a winning card (with a green border) and a losing card (with a red border) and you'll have to complete a description of the winning card.

The guesser will read your description and they'll see both cards but they won't know which one is the winning card.

[In this game both you and the guesser score points when the guesser clicks on winning cards. / In this game both you and the guesser score points when the guesser scores points when they click on winning cards whereas you score points when the guesser clicks on losing cards.]

The guesser knows that this is a competitive game but they don't know that you are completing the descriptions instead of writing them freely.

Please complete the instruction with ONLY ONE WORD. You can talk about a colour or a type of object.

You can write false descriptions [and/but] remember that you are [helping / playing against] the guesser so your goal is to make them [win/lose].

**Control questions [and answers] for both conditions:**

Before you play, let's check that you know the rules:

(You won't be able to play if you get these wrong)

The winning card is...  [The red one / The green one]

Your descriptions can be...  [Only true / Either true or false]

In this game you are...  [Helping the guesser click on winning cards / Playing against the guesser]

You can write...  [Maximum 1 word / Maximum 3 words]

---

<table>
<thead>
<tr>
<th>Item</th>
<th>Description: “On the winning card…”</th>
<th>True</th>
<th>False</th>
<th>Item Type</th>
<th>Description: “On the winning card…”</th>
<th>True</th>
<th>False</th>
</tr>
</thead>
<tbody>
<tr>
<td>Num_01</td>
<td>two of the objects are blue</td>
<td>Mugs</td>
<td></td>
<td>None_19</td>
<td>none of the objects are green</td>
<td>pink</td>
<td></td>
</tr>
<tr>
<td>Num_02</td>
<td>two of the objects are socks Pink</td>
<td>Pink</td>
<td></td>
<td>None_20</td>
<td>none of the objects are cakes</td>
<td>teapots</td>
<td></td>
</tr>
<tr>
<td>Num_03</td>
<td>two of the objects are yellow</td>
<td>saws</td>
<td></td>
<td>None_21</td>
<td>none of the objects are pink</td>
<td>yellow</td>
<td></td>
</tr>
<tr>
<td>Num_04</td>
<td>three of the objects are Boats green</td>
<td>None_22</td>
<td>none of the objects are kettles</td>
<td>bananas</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Num_05</td>
<td>three of the objects are Buckets yellow</td>
<td>None_23</td>
<td>none of the objects are Blue</td>
<td>pink</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Num_06</td>
<td>three of the objects are Pink</td>
<td>candles</td>
<td>None_24</td>
<td>none of the objects are Pans</td>
<td>jars</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Most_07</td>
<td>most of the objects are Pink keys</td>
<td>None_25</td>
<td>none of the objects are Blue green</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Most_08</td>
<td>most of the objects are lamps yellow</td>
<td>None_26</td>
<td>none of the objects are cars sofas</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Most_09</td>
<td>most of the objects are yellow</td>
<td>flags</td>
<td>None_27</td>
<td>none of the objects are Blue yellow</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Most_10</td>
<td>most of the objects are beds blue</td>
<td>All_28</td>
<td>all of the objects are umbrellas Rockets</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Most_11</td>
<td>most of the objects are pink books</td>
<td>All_29</td>
<td>all of the objects are green Yellow</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Most_12</td>
<td>most of the objects are flowers blue</td>
<td>All_30</td>
<td>all of the objects are Shoes trophies</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ad hoc_13</td>
<td>the objects in the top row are blue</td>
<td>kites</td>
<td>All_31</td>
<td>all of the objects are Pink green</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ad hoc_14</td>
<td>the objects in the middle row are</td>
<td>crowns</td>
<td>blue</td>
<td>All_32</td>
<td>All of the objects are Drums tents</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ad hoc_15</td>
<td>the objects in the bottom row are</td>
<td>yellow forks</td>
<td>All_33</td>
<td>all of the objects are yellow Pink</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ad hoc_16</td>
<td>the objects in the top row are</td>
<td>yellow forks</td>
<td>All_34</td>
<td>all of the objects are Trumpets Carrots</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ad hoc_17</td>
<td>the objects in the middle row are</td>
<td>green apples</td>
<td>All_35</td>
<td>all of the objects are blue Pink</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ad hoc_18</td>
<td>the objects in the bottom row are</td>
<td>pink bells</td>
<td>All_36</td>
<td>all of the objects are bottles Bikes</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>