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Bonnema, Ariska; Hukker, Vera; Hendriks, Petra

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Does reported speech influence listeners' choice of perspective in the interpretation of spatial prepositions?

Ariska I. Bonnema

University of Groningen

Faculty of Arts

Oude Kijk in 't Jatstraat 26

9712 EK Groningen

The Netherlands

a.i.bonnema@rug.nl

Vera Hukker

University of Groningen

Faculty of Arts

Oude Kijk in 't Jatstraat 26

9712 EK Groningen

The Netherlands

v.hukker@rug.nl

Petra Hendriks

University of Groningen

Faculty of Arts

Oude Kijk in 't Jatstraat 26

9712 EK Groningen

The Netherlands

p.hendriks@rug.nl

Abstract

Linguistic cues can encourage adults to adopt an other-centric rather than an egocentric perspective. This study investigated whether the presence of direct speech compared to indirect speech influences listeners' choice of perspective when interpreting the Dutch spatial prepositions *voor* 'in front of' and *achter* 'behind'. Dutch adults and 10 to 12-year-old children were tested in a sentence-picture verification task. Contrary to expectations, we found no difference between direct and indirect speech (Study 1), nor did we find a difference between reported and non-reported speech (Study 2). Most adult listeners adopted the contrasting perspective of the speaker, irrespective of how the information about the reported speech was expressed. We did find a difference between adults and children: children adopted the other person's perspective less often than adults did. Overall, the results suggest that the mere presence of a reported speaker already is a cue for taking this speaker's perspective.

Keywords: perspective taking, reported speech, reference frames, spatial prepositions

1. Introduction

1.1 Different spatial perspectives

"Wait behind the yellow line" is a sentence that can often be seen at airports. Even though the message seems straightforward, the sentence can be interpreted in many different ways. Which perspective should travelers take when considering where to wait? Should they take a perspective relative to the customs booth, their own perspective, or the perspective of the customs official? Depending on which perspective is chosen, the sentence receives a different interpretation.

Language users can use different reference frames when interpreting spatial prepositions such as *in front of* or *behind*. A reference frame (RF) is a particular way to view the spatial relations between elements in the world, such as objects or people. Levinson (1996, 2003: Ch.2) distinguishes an absolute, an intrinsic, and a relative RF. When an absolute RF is used, the position of objects is related to arbitrary fixed points such as cardinal directions (e.g., "The ball is north of the chair"). When a relative RF is used, objects are related to a person's perspective, which can be their own, egocentric, perspective or someone else's, other-centric, perspective (e.g., "The bottle is to the left of the chair", which can be left from either the speaker's egocentric perspective or from someone else's perspective). Finally, according to an intrinsic RF, the position of objects is related to other objects for which the relation is determined based on features of these objects such as their

front and back parts (e.g., “The ball is in front of the chair” when the ball is placed in such a position that the front side of the chair faces the ball). Which RF a speaker or listener uses depends on various situational factors, such as the characteristics of objects or the purpose of the task (e.g., Bullens, Lienenkämper, Wijnen, & Postma, 2013). Often, more than one RF can be used in a particular situation, resulting in ambiguity.

In addition to situational factors, the choice of RF also depends on linguistic factors such as the language under consideration. For example, Levinson (2003: Ch.4) presented native speakers of Dutch and native speakers of Tzeltal with a task in which they had to reconstruct a spatial scene of objects. In the task, participants had to remember the order in which four animals were positioned on a table. After the animals were removed from the table, participants were instructed to wait for 45 seconds and then turn around 180 degrees to another table. They were then told to rebuild the original scene ‘exactly as it was’. This could be done either by using an absolute RF or a relative RF. The results showed that Tzeltal speakers preferred to reconstruct the spatial scene using an absolute RF, whereas the Dutch speakers preferred to reconstruct the spatial scene using a relative RF, in line with the dominant patterns in their respective languages. In the current study, we look at a different linguistic factor, namely type of linguistic construction. We will compare the interpretation of spatial prepositions in direct speech reports (e.g., He said: “It is raining”) to the interpretation of spatial prepositions in indirect speech reports (e.g., He said that it is raining) to see which relative RF, an egocentric or an other-centric RF, listeners select. Intrinsic and absolute RFs will not be relevant for the current study (but see section 2.2 for discussion).

Several studies have established that an egocentric perspective is our default perspective and therefore requires the least mental effort when considering the world (Duran, Dale & Kreuz, 2011; Epley, Morewedge & Keysar, 2004; Keysar, Barr, Balin & Brauner, 2000). Choosing a relative RF based on an other-centric perspective is expected to be cognitively demanding because the egocentric perspective must be suppressed. Therefore, a relevant question is when children acquire the ability to interpret spatial prepositions from another person’s perspective.

The current study focuses on spatial prepositions inside speech reports and investigates whether direct speech reports influence the interpretation of spatial prepositions differently compared to indirect speech reports. Direct speech reports have been found to elicit a perspective shift in the interpretation of the deictic pronouns such as *you* (Köder, Maier & Hendriks, 2015) and may thus also influence the interpretation of perspective-dependent spatial prepositions. A further question is whether children are sensitive to the difference between direct and indirect speech reports. This will be tested in a sentence-picture verification task with Dutch-speaking 10 to 12-

year-old children and adults. Previous research (Hukker & Hendriks, 2017) showed that children aged 9 and 10 are able to interpret spatial prepositions from another person's perspective. However, when they are free to choose between an egocentric and an other-centric perspective, they rarely choose the other-centric perspective. We investigate whether this is the same for children's interpretation of spatial prepositions in speech reports. Before we discuss the study and its findings, we first present an overview of earlier findings.

1.2 Shifting between an egocentric and an other-centric perspective

Tversky and Hard (2009) investigated some of the factors leading participants to take an other-centric rather than an egocentric perspective. In Tversky and Hard's perspective-taking experiments, each participant saw one photograph and received one question about that photograph. This test item was part of a larger set of unrelated test items presented as a written questionnaire. In all experiments, the photograph showed the same two objects, namely a bottle and a book. In one experiment, participants were presented with one of three photographs: a photograph in which only the bottle and the book are visible on a table, the same photograph with a person sitting behind the table looking at the objects, and a photograph with a person sitting behind the table reaching for one of the objects. Participants had to answer the question "In relation to the bottle, where is the book?". In their responses, participants took an other-centric perspective more often when a person was present in the photograph. From this it can be concluded that the mere presence of a person, which is a visual cue, can elicit a perspective shift. In a second experiment, participants saw a photograph with a person reaching for one of the two objects, and were asked one of four questions. The question mentioned both the actor and the action ("In relation to the bottle, where does he place the book?"), only the actor ("In relation to the bottle, where is his book?"), only the action ("In relation to the bottle, where is the book placed?"), or neither the actor nor the action ("In relation to the bottle, where is the book?"). Participants took an other-centric perspective more often when the question mentioned the action compared to when it did not. Thus, also linguistic cues, in this case, mentioning an action, can elicit a perspective shift in language production.

Duran et al. (2011) investigated the choice between an egocentric and an other-centric perspective in listeners. In a digital task, participants had to hand over one of two leaflets requested by a virtual speaker. The position of the target leaflet was indicated by the virtual speaker's use of *on the left*, *on the right*, *in the back* or *in the front*. In their first experiment, 52% of the participants

were classified as other-centric, whereas 39% were classified as egocentric, which shows that also listeners frequently shift to another person's perspective.

The perspective-taking behavior of children was investigated by Hukker and Hendriks (2017). In one task, adult and child participants had to judge whether a verbal description matched a particular configuration of objects on the computer screen. In another task, the same participants had to place objects in a particular configuration on the computer screen based on verbal instructions. The descriptions and instructions in the tasks contained a Dutch spatial preposition (*voor* 'in front of', *achter* 'behind', or *naast* 'next to') and were uttered by an animal present in the scene. Adult listeners took the animal's other-centric perspective in 30% (descriptions) and 34% (instructions) of cases, whereas child listeners, aged 9 and 10, took the other-centric perspective in 15% (descriptions) and 14% (instructions) of cases. So adults mostly took their own perspective, although it was possible in the experiment to take the perspective of the speaker who was present in the scene, and 9 and 10-year-old children were even more egocentric than adults. However, in a visual perspective-taking task in which the same participants were explicitly asked to adopt an other-centric perspective, the children were able to do so in 85% of cases. The question is therefore why they took the other-centric perspective less often than adults in the description and instruction tasks, and did so in only a minority of cases. To extend our knowledge of children's development of perspective taking with spatial prepositions, we examine slightly older children's interpretation of prepositions in a different linguistic task.

1.3 Linguistic cues in perspective taking

As the studies discussed above show, adults and children frequently take another person's perspective when speaking or comprehending language, even when they are not explicitly told to do so. They shift from their own to another person's perspective influenced by visual, but also linguistic cues.

A linguistic context that has been found to elicit a perspective shift in language is a direct speech report. If a speaker utters the direct speech report "Mary said: "You can have the apple"", the listener has to shift their perspective from the speaker to Mary to interpret the deictic pronoun *you* as referring to Mary's addressee, and not the speaker's addressee. In contrast, indirect speech reports (e.g., "Mary said that you can have the apple") do not elicit such a perspective shift; *you* here refers to the speaker's addressee. The interpretation of the deictic pronoun *you* has been shown to take longer and result in more errors in direct speech reports than indirect speech reports (Köder,

Maier, & Hendriks, 2015), likely reflecting the effort associated with the perspective shift. The current study investigates whether direct speech reports can serve as a cue for taking the speaker's perspective when interpreting spatial prepositions. If so, participants are expected to shift to an other-centric perspective more often when the spatial preposition occurs in direct speech compared to indirect speech. Furthermore, we ask whether children are as sensitive as adults in employing this linguistic cue.

Study 1

2. Method

2.1 Participants

In total, 31 adults and 36 children participated in the study. The adults were students from the University of Groningen. The children were from a primary school in the province of Friesland. The adult participants and parents of child participants gave written informed consent prior to testing. All participants had Dutch as their native language. Participants were excluded if they were bilingual (e.g., Dutch-Frisian), or had been diagnosed with Autism Spectrum Disorder (ASD) or dyslexia. Based on these criteria, seven adult participants (bilingual: 2, ASD: 2, dyslexia: 3) and one child participant (dyslexia) were excluded. This resulted in an adult group consisting of 24 adults (14 women) with a mean age of 23 (age range 20-28), and a child group of 35 children (19 girls) with a mean age of 11;9 (age range 10;4-12;10).

2.2 Materials and design

To assess the perspective-taking behavior of participants, a sentence-picture verification task was carried out on a laptop computer using E-prime (Psychology Software Tools, Pittsburgh PA). In this task, participants had to judge whether a sentence containing a spatial preposition matched a picture showing a spatial configuration of two objects. The experiment had a 2x2 within-subjects design, with the factors speech (direct vs. indirect) and perspective (egocentric vs. other-centric).

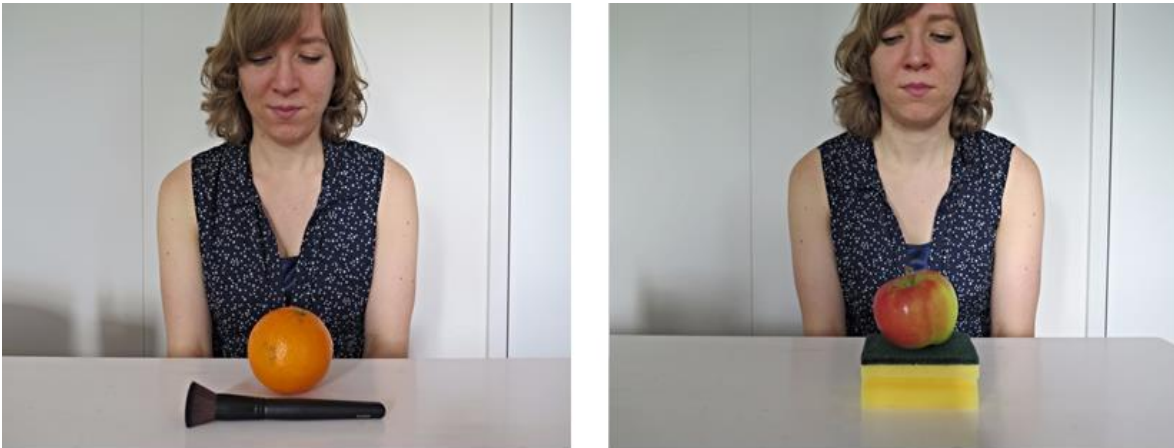


Figure 1. Example of a picture of a test item (left) and a control item (right).

The test sentences each contained a perspective-dependent spatial preposition (either *voor* ‘in front of’ or *achter* ‘behind’) and were in direct speech (1) or indirect speech (2):

- (1) Zij zei: “De kwast ligt voor de sinaasappel”.
 she said: the brush lies in-front-of the orange
 ‘She said: “The brush is in front of the orange” ’
- (2) Zij zei dat de kwast voor de sinaasappel ligt.
 she said that the brush in-front-of the orange lies
 ‘She said that the brush is in front of the orange’

In Dutch, direct and indirect speech are clearly distinguished syntactically, as direct speech is characterized by SVO word order, whereas indirect speech is characterized by SOV word order and in addition must contain a complementizer. Each test sentence was accompanied by a picture. In each picture a table was shown with two objects on it in a particular spatial configuration, and a woman on the opposite side of the table who was looking at the objects (see Figure 1). The test sentence either matched the egocentric perspective of the participant, or the other-centric perspective, that is, the perspective of the woman in the picture.

The task consisted of 64 items in total: 32 items in the direct speech condition and 32 items in the indirect speech condition. Figure 2 shows the distribution of items within conditions. Per condition, there were 16 test items and 16 control items. Half of the test items contained the perspective-dependent preposition *voor* ‘in front of’, and the other half contained the perspective-dependent preposition *achter* ‘behind’. Per preposition half of the items matched the egocentric

perspective of the participant, and the other half matched the other-centric perspective of the woman in the picture. Control items had a similar structure but contained the perspective-independent spatial prepositions *op* ‘on’ and *onder* ‘under’. Therefore, control items could be interpreted without selecting a particular perspective.

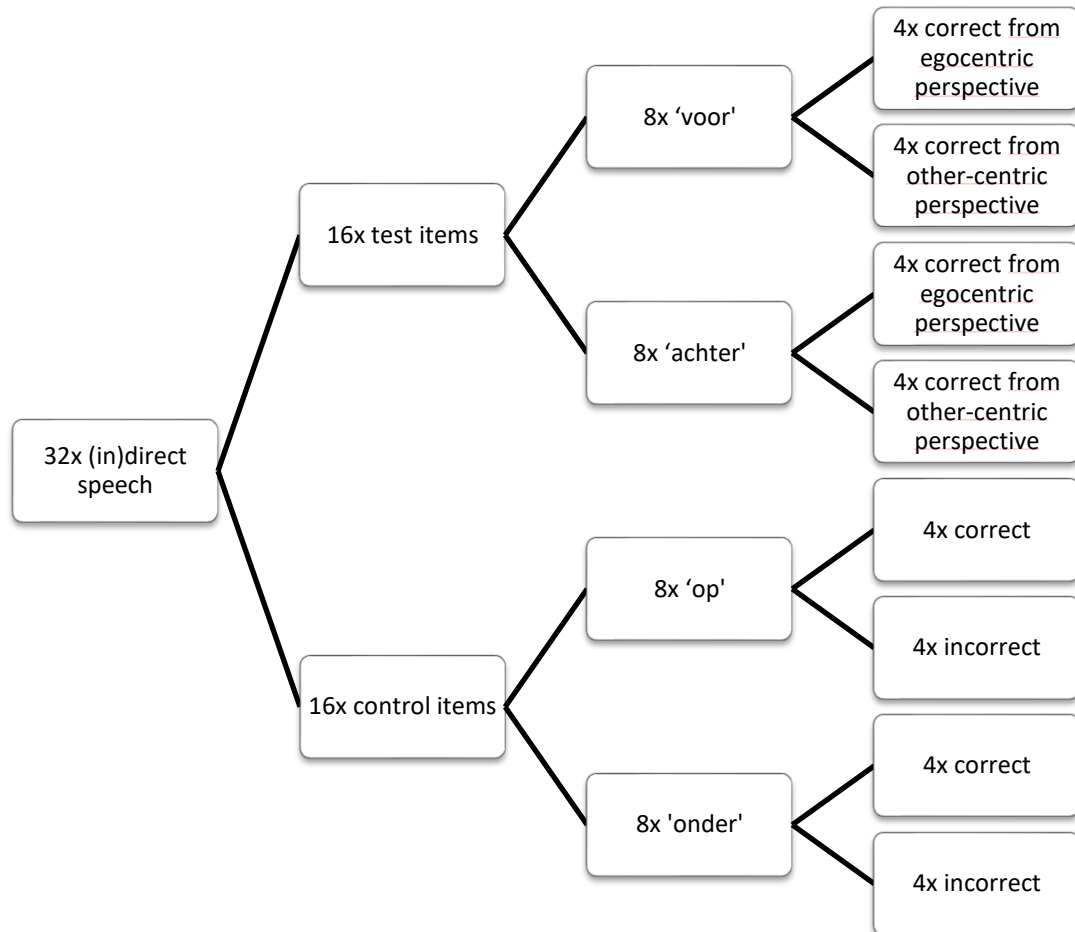


Figure 2. The distribution of test and control items per condition.

Each picture showed two everyday objects. Only 8 of the 32 test items had an object with a clear front and back (e.g., a horse, a car). Since objects with a clear front and back can elicit an intrinsic RF (Taylor & Rapp, 2004), we placed such objects in a neutral position with their front pointed to the left or right of the participant. If participants were to adopt an intrinsic RF for these objects, they would give no-responses to all of these items. A post-hoc inspection of individual patterns revealed that none of the participants showed an intrinsic pattern in their responses to these items.

When the test started, participants saw a picture on the laptop screen and heard a pre-recorded sentence. They then had to indicate whether the sentence matched the picture or not. If the sentence matched the picture, participants had to press a green button on the laptop keyboard. If the sentence did not match the picture, participants had to press a red button.

2.3 Procedure

All participants were tested individually in a quiet room by the same experimenter. Adults were tested at the university, and children were tested at their school. Each test session took approximately 20 minutes.

Prior to the experiment, participants received short instructions that were presented on the screen. In these instructions, the woman in the pictures was introduced as Jannika from Iceland, who does not speak Dutch. Therefore, the experimenter was going to tell the participant what Jannika had said about the objects on the table. After the instructions, the experiment started with two practice items with the prepositions *on* and *under*, followed by the rest of the items.

The direct speech items and the indirect speech items were presented in two separate blocks, with a non-linguistic task (not relevant for the current study) in between, that functioned as a distraction task. Within blocks the items were randomized. The order of the direct speech block and the indirect speech block was balanced across participants.

3. Results

Adult participants gave correct responses to the control items in 98% of cases in both direct speech and indirect speech. Figure 3 shows the results of the adult participants on the test items.

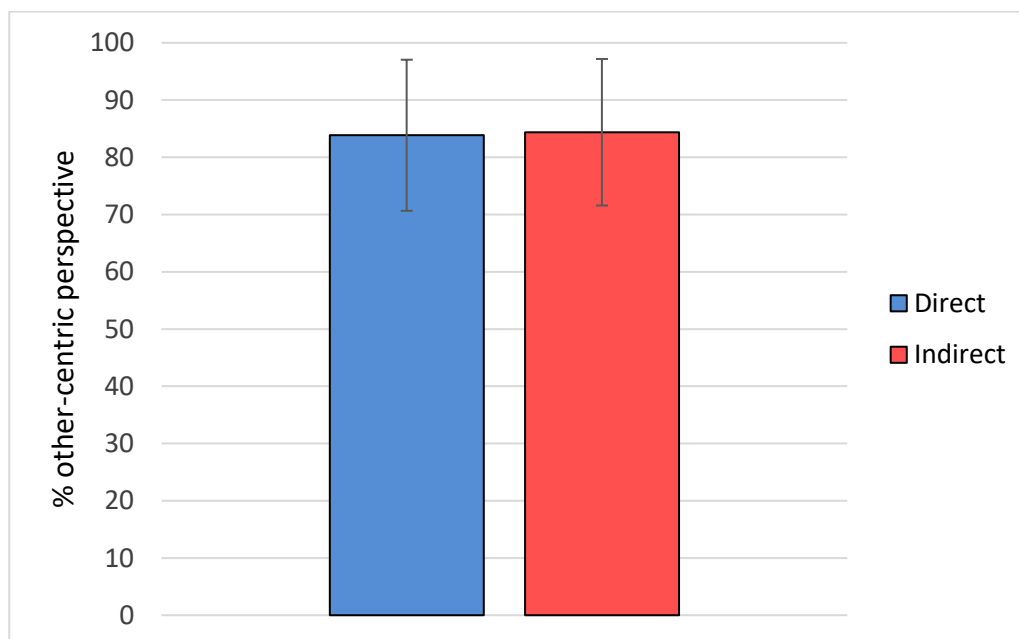


Figure 3. Percentage of other-centric responses by adults in direct and indirect speech.

Because the responses on the sentence-picture verification task were not normally distributed, nonparametric tests were used to analyze the data. A Wilcoxon signed-rank test was used to determine whether adult participants showed different perspective-taking behavior in direct speech compared to indirect speech. It turned out there was no difference between direct and indirect speech. In direct speech, the other-centric perspective was chosen in 84% of cases ($Mdn=1$). In indirect speech, the other-centric perspective was also chosen in 84% of cases ($Mdn=0.97$). This difference was not significant, $p=1$, $Z=0$, $r=0$.

Child participants gave correct responses to the control items in 95% of cases in direct speech and in 96% of cases in indirect speech. Figure 4 shows the results of the child participants on the test items.

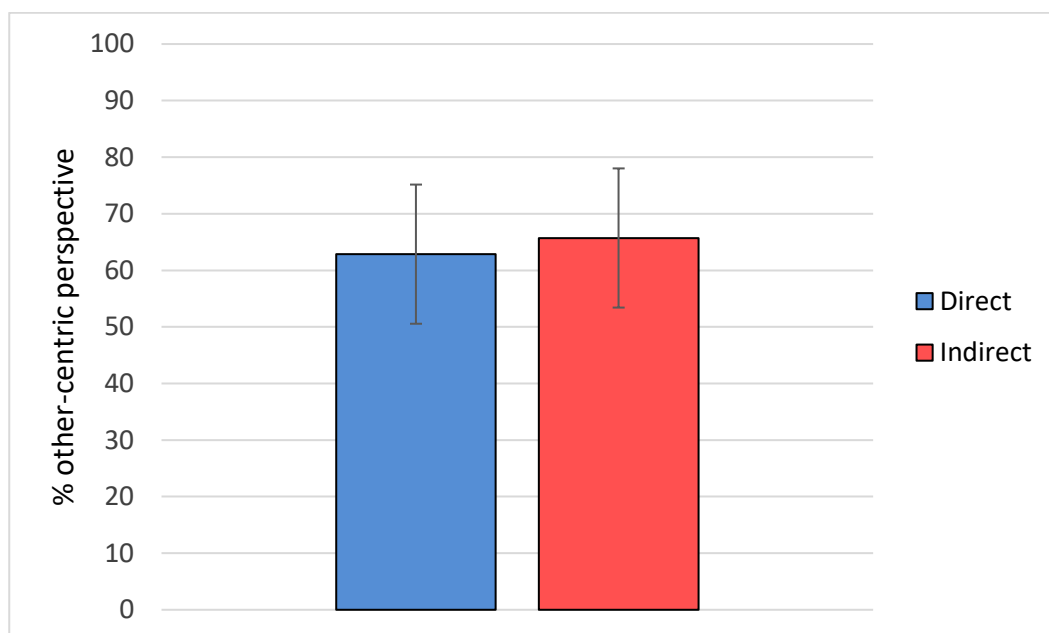


Figure 4. Percentage of other-centric responses by children in direct and indirect speech.

Also for children, a Wilcoxon signed-rank test indicated that there was no difference in perspective-taking behavior between the direct and indirect speech conditions. In direct speech, the other-centric perspective was chosen in 63% of cases ($Mdn=0.81$), while in indirect speech the other-centric perspective was chosen in 66% of cases ($Mdn=0.88$). This difference was not significant, $p=0.60$, $Z=-0.523$, $r=0.09$.

Since for both adults and children there was no difference between the direct and indirect speech conditions, we collapsed these two conditions and looked at the difference between adults and children regardless of speech condition. The results can be seen in Figure 5.

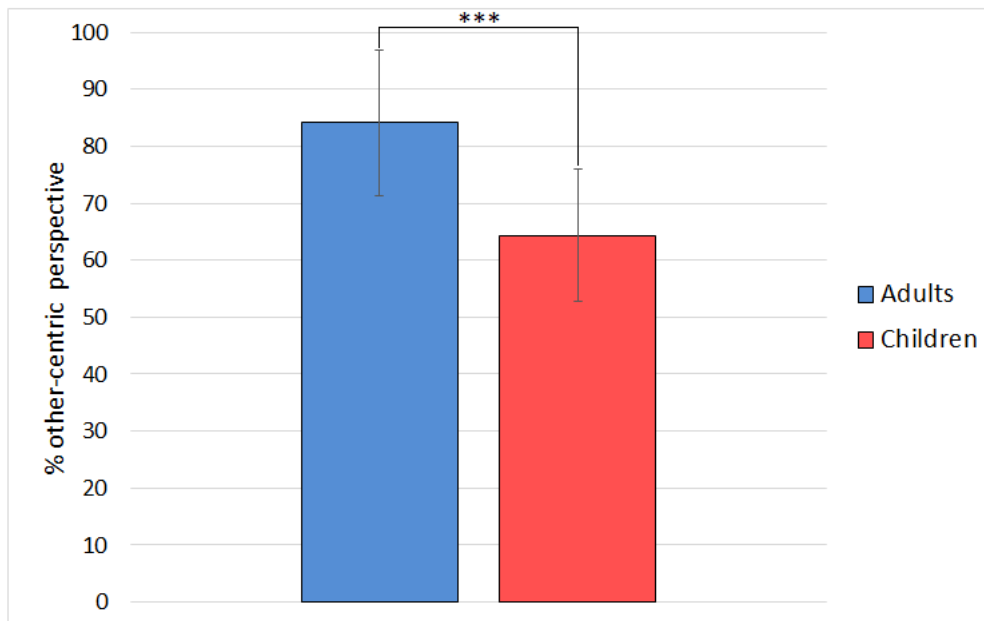


Figure 5. Percentage of other-centric responses on all test items by adults and children.

A Mann-Whitney U test indicated that the difference in perspective-taking behavior between children ($M=0.64$, $SD=0.35$, $Mdn=0.78$) and adults ($M=0.84$, $SD=0.32$, $Mdn=0.97$) is significant $U=246$, $p<0.01$, $r=0.35$.

An inspection of the participants' individual performance allows us to establish whether the children's group performance of 63% other-centric responses (direct speech) and 66% other-centric responses (indirect speech) is due to individual children showing chance performance in their choice of perspective, or to individual children showing consistent but different choices of perspective.

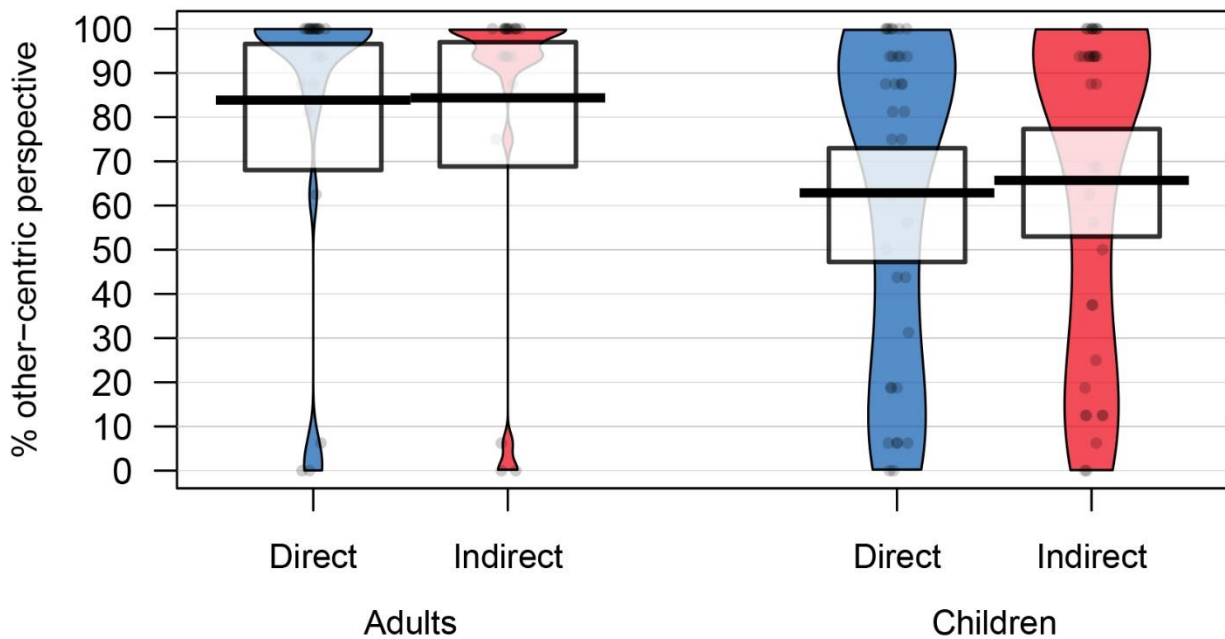


Figure 6. Visualization of the participants' mean percentages of other-centric responses per group (adults versus children) and type of speech report (direct versus indirect). The black dots are means per participant, the horizontal bars are group means, the shape of the plots are density curves per distribution, and the boxes show the inferences around the mean.

Figure 6 shows that adults either consistently took an other-centric perspective or consistently took an egocentric perspective, but hardly ever gave mixed responses. The pattern for children is somewhat less clear, but nevertheless presents a similar picture. Most children took an other-centric or egocentric perspective, and only a minority of children showed chance performance.

4. Discussion of Study 1

4.1. Direct versus indirect speech

This study addressed two questions. The first question was whether the difference between direct and indirect speech reports influences listeners' interpretation of spatial prepositions. Based on Köder et al. (2015), our expectation was that participants would take the other-centric perspective more often in the direct speech condition compared to the indirect speech condition. However, contrary to our expectations, we did not find a difference between spatial prepositions in direct speech compared to indirect speech. In both conditions, adults took the other person's perspective in 84% of cases. Children did so in 63% (direct speech) and 66% (indirect speech) of cases.

A possible explanation for the difference between our results with spatial prepositions and Köder et al.'s (2015) results with deictic pronouns is that an extra perspective shift is required for deictic pronouns in direct speech, whereas such a perspective shift is optional for spatial prepositions. Compare the sentences below:

- (3) Elephant said: “You get the football”.
- (4) Elephant said that I get the football.
- (5) She said: “The apple is in front of the orange”.
- (6) She said that the apple is in front of the orange.

In the scenario used by Köder et al., one animal reports to another animal what a third animal (here: elephant) said to him. In that scenario, the pronoun *you* in (3) and the pronoun *I* in (4) both refer to the actual speaker of the utterance. To select the correct referent of *you* in the direct speech report in (3), the listener needs to shift from the perspective of this actual speaker to the perspective of the reported speaker, elephant. If listeners fail to do so, they will incorrectly interpret *you* in (3) as referring to the addressee of the utterance. No such perspective shift from the actual to the reported speaker is needed to interpret pronouns in indirect speech reports as in (4). Here, the deictic pronoun must be interpreted from the perspective of the actual speaker. In direct speech sentence (5), in contrast, we cannot tell whose perspective is taken. The apple could be in front of the orange from the perspective of the reported speaker, but also from the differing perspective of the actual speaker or a non-mentioned addressee. The same ambiguity is present in the indirect speech sentence (6). While sentences (5) and (6) with the preposition *in front of* have a different meaning than the same sentences would have with the preposition *behind*, the sentences with *in front of* and *behind* can be used to describe the exact same situation. The difference between the deictic pronouns *I* and *you* and the spatial prepositions *in front of* and *behind* demonstrates that different linguistic expressions can behave differently in terms of their perspective-taking behavior. Thus, whereas deictic pronouns force the speaker and listener to adopt a particular perspective, spatial prepositions leave all perspectival possibilities open.

4.2. Children versus adults

The second research question was whether there would be a difference between adults and children in the interpretation of spatial prepositions. Based on the results of Hukker and Hendriks (2017), it was expected that children would less often interpret spatial prepositions from the other-centric

perspective than adults. This expectation was confirmed by the results of the experiment. Whereas adults chose the other-centric perspective in 84% of cases, 10 to 12-year-old children did so in on average 64% of cases. This suggests that even at age 12, children are not yet adult-like in their interpretation of spatial prepositions and do not consider the other person's perspective as often as adults do.

4.3 Comparison with previous studies

In our study, both adults and children took the other-centric perspective in the majority of cases, namely 84% (adults) and 64% (children) of cases. These percentages are much higher compared to similar studies on perspective-taking behavior. For example, in Tversky and Hard's (2009) study, adults took the other-centric perspective in 21%-50% of cases and in the study of Hukker and Hendriks (2017) in 30%-33% of cases. Furthermore, the children in Hukker and Hendriks's study took the other-centric perspective in only 13%-15% of cases. Since our study differed in several respects from these earlier studies, we cannot be certain which aspects of our task were responsible for this result. To establish whether it was the presence of reported speech in general that was responsible for the high percentage of other-centric responses, or whether this was caused by other aspects of our materials such as the explicit introduction of the woman present in the picture, we carried out a second study in which we tested participants on a similar task but without the use of reported speech.

Study 2

5. Method

5.1 Participants

In total, 29 adults participated in Study 2, all different from the participants in Study 1. Participants were students from the University of Groningen and gave written informed consent. All participants had Dutch as their native language. The same inclusion criteria as in Study 1 applied. Based on these criteria, five participants were excluded (bilingual: 4, dyslexia: 1). In addition, one person who had participated in a similar experiment was excluded. This resulted in a sample of 24 adults (10 women), mean age 23 (age range 20-44).

5.2 Materials and design

Study 2 had a 1x2 within-subjects design with the factor perspective (egocentric vs. other-centric). In this study, the same pictures were used as in Study 1. To test the specific effect of reported speech, the test sentences and control sentences of the direct speech condition were adapted from reported speech into non-reported speech. This was done by removing the first part of the audio fragment of each direct speech item. For example, if the original sentence was *Zij zei: "De kwast ligt voor de sinaasappel"* (She said: "The brush is in front of the orange"), the first part consisting of the words *zij zei* (she said) was removed from the audio file. This resulted in non-reported speech (*De kwast ligt voor de sinaasappel*). The task consisted of 32 items with the same distribution as shown in Figure 1. The items were presented in a randomized order.

5.3 Procedure

The procedure was identical to the procedure of Study 1. Because Study 2 involved only one block, there was no break and the experiment only took about 7 minutes.

6. Results

In order to make a fair comparison avoiding potential effects of experience, the results of Study 2 (32 items) are compared with the results of the first block of Study 1 (32 items). Like in Study 1, participants in Study 2 responded correctly on the control items in 98% of cases. The overall results on the test items of Study 1 and Study 2 are shown in Figure 7.

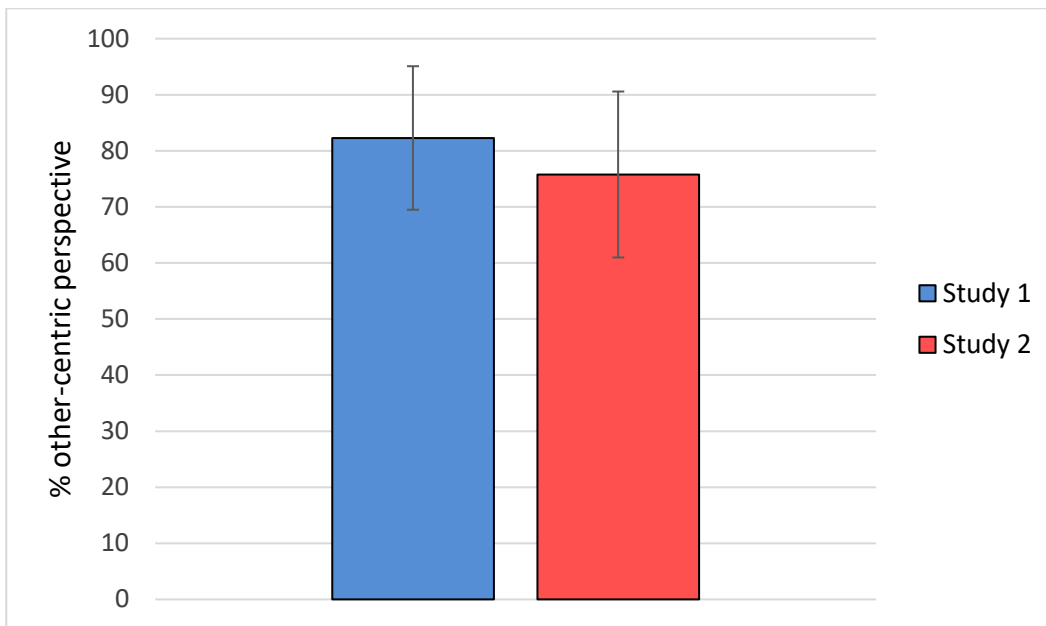


Figure 7. Percentage of other-centric perspective responses by adults in reported speech (block 1 of Study 1) and non-reported speech (Study 2).

A Mann-Whitney U test indicated that the difference in perspective-taking behavior between reported speech in Study 1 ($M=0.82$, $SD=0.32$, $Mdn=0.94$) and non-reported speech in Study 2 ($M=0.76$, $SD=0.37$, $Mdn=0.94$) is not significant $U=317.5$, $p<0.531$, $r=0.09$.

7. General discussion

Our first question was whether direct speech influences listeners' interpretation of spatial prepositions differently compared to indirect speech. Because an additional perspective shift is needed for deictic pronouns in direct speech compared to indirect speech (cf. Köder et al., 2015), we expected direct speech to elicit more other-centric perspective responses with spatial prepositions than indirect speech. Contrary to our expectations, we did not find a difference between the two reported speech conditions. Thus, whereas a perspective shift is required when the direct speech report contains the deictic pronoun *you*, such a perspective shift does not appear to be required when the direct speech report contains a perspective-dependent spatial preposition (*in front of*, *behind*).

In Study 1, adults selected the other-centric perspective in a large majority of cases. A possible explanation for this pattern could be that, with spatial prepositions, reported speech in general elicits a perspective shift. In a second study, we compared the effect of reported speech in general (direct as well as indirect speech) to the effect of non-reported speech. Again, we did not

find any difference between the two conditions. Also in Study 2, adults selected the other-centric perspective in a large majority of cases.

We believe these results can be explained in two ways. A first possibility is that reported speech does not affect the choice of perspective, and the visual cue of the other person is already sufficient for listeners to take the other-centric perspective. However, if true, we need to find a different explanation for the specific effect of direct speech on the interpretation of *you* in Köder et al. (2015). A second possibility is that not only explicitly reported speech (as in Study 1, where all sentences started with “She said”), but also implicitly reported speech (as in Study 2), elicits a perspective shift. That is, in the task instructions in both studies participants were told that the speech of the woman in the pictures would be reported (“I will tell you what Jannika has said”). Perhaps this instruction was already sufficient for adults to interpret all sentences as reported speech, although the sentences in Study 2 did not have the form of reported speech. This possibility is supported by participants’ remarks at the end of the test session. When we asked participants why they chose the woman’s perspective, they said they did so because the task instructions mentioned that the woman was the original speaker of the sentence. We thus predict that if the task instructions do not mention that the sentences are reported speech, a much lower percentage of adult responses will be other-centric.

Our second research question was whether children are as sensitive as adults in employing linguistic cues to perspective. Like the adults, the children did not distinguish between the linguistic cues either. However, they chose the other-centric perspective less often than adults, namely in 64% of cases compared to 84% of cases in adults. Thus, even at age 12 children are not entirely adult-like yet when interpreting spatial prepositions. This is surprising, since children already possess a fully developed theory of mind at that age (Wimmer & Perner, 1983), and know that others can have a different visual perspective (Flavell, Flavell, Green & Wilcox, 1980). Our results support the idea that children are still developing in their ability to apply their knowledge of perspective taking in concrete linguistic situations. Further research is needed to establish when children’s perspective-taking behavior becomes adult-like and why this development is so slow.

8. References

Bullens, Jessie, Nina Lienenkämper, Frank Wijnen & Albert Postma. 2013. “Children’s use of spatial reference frames in verbal and non-verbal tasks.” *Language and Action in Cognitive*

Neuroscience ed. by Y. Coello & A. Bartolo, 177-190. Hove, East Sussex: Psychology Press.

Duran, Nicholas D., Rick Dale & Roger J. Kreuz. 2011. "Listeners invest in an assumed other's perspective despite cognitive cost." *Cognition* 121(1): 22-40.

Epley, Nicholas, Carey K. Morewedge & Boaz Keysar. 2004. "Perspective taking in children and adults: Equivalent egocentrism but differential correction." *Journal of Experimental Social Psychology* 40(6): 760-768.

Flavell, John H., Eleanor F. Flavell, Frances L. Green & Sharon A. Wilcox. 1980. "Young children's knowledge about visual perception: effect of observer's distance from target on perceptual clarity of target." *Developmental Psychology* 16(1): 10-12.

Hukker, Vera & Petra Hendriks. 2017. "Whose side are they on? Children's interpretation of perspective-dependent prepositions." *Linguistics in the Netherlands* ed. by S. Lestrade & B. Le Bruyn, 63-76.

Keysar, Boaz, Dale T. Barr, Jennifer A. Balin & Jason S. Brauner. 2000. "Taking perspective in conversation: The role of mutual knowledge in comprehension." *Psychological Science* 11(1): 32-38.

Köder, Franziska, Emar Maier & Petra Hendriks. 2015. "Perspective shift increases processing effort of pronouns: a comparison between direct and indirect speech." *Language, Cognition and Neuroscience* 30(8): 940-946.

Levinson, Stephen C. 1996. "Frames of reference and Molyneux's question: Crosslinguistic evidence." *Language and space* ed. by P. Bloom & M. Peterson, 109-169. Cambridge, MA: MIT press.

Levinson, Stephen C. 2003. *Space in Language and Cognition: Explorations in Cognitive Diversity*. Cambridge: Cambridge University Press.

Psychology Software Tools, Inc. [E-Prime 2.0]. 2012. <http://www.pstnet.com>

Tversky, Barbara & Bridgette M. Hard. 2009. "Embodied and disembodied cognition: Spatial perspective-taking." *Cognition* 110(1): 124-129.

Wimmer, Heinz, & Josef Perner. 1983. "Beliefs about beliefs: Representation and constraining function of wrong beliefs in young children's understanding of deception." *Cognition* 13(1): 103-128.