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Chapter 5

Assessing Perspective-Taking in Children through Different Formats of Deictic Framing Protocol

María M. Montoya-Rodríguez and
Francisco J. Molina Cobos

Additional information is available at the end of the chapter

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Abstract

The modern behavioral account of human language and cognition known as Relational Frame Theory (RFT) has argued that deictic relations are key repertoires underlying the development of the ability to take the perspective of another individual. Several studies have employed a deictic framing-based test protocol as an assessment of perspective-taking. In recent years, the format of the protocol has been modified in different studies. However, no empirical investigations have compared the original protocol with the new formats. The present chapter reports two studies that investigated whether a deictic relational protocol based on modification from recent research demonstrated better performance versus traditional deictic relations measured, with typically developing children. Results of Study 1 showed that variability in the scenarios proposed by recent research could be the best option, although a series of modifications should be made for the target population. Results of Study 2 showed that a combination of both original and new protocols of deictic relations gave a better performance on the perspective-taking task in the sample used. This chapter supports the need to adapt perspective-taking protocol to the work with children.

Keywords: deictic relations, RFT, perspective-taking, children, contextual behavioral science

1. Introduction

Perspective-taking has been defined as the social-cognitive ability to assume another individual's perspective, to infer thoughts, emotions, and motivations [1]. For many years, mainstream developmental psychologists have studied children's development regarding the understanding of thoughts and beliefs of others (for a review see [2]). This cognitive approach,

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known as Theory of Mind (ToM) [3], has been an inspiration for psychologists studying typical and atypical development in children. Indeed, a search conducted using the filter "theory of mind" in PsycINFO, returned more than 6400 entries— including theses, books, and journal articles. An interest in these phenomena has also been shown by behavioral psychologists. The recently developed Relational Frame Theory (RFT) [4], which is a modern behavioral approach to the study of language and cognition, considers perspective-taking as generalized operant behavior that can be learned [5–7]. In line with the RFT approach, learning to respond to appropriate questions defined on the base of deictic relations — such as I-YOU, HERE-THERE, and NOW-THEN—, appears to be critical in establishing perspective-taking repertoires [8]. Such relations have been learned from a history of multiple exemplars of asking and responding to questions such as, "What am I doing now?", "What did you eat then?" or "Where were you jumping then?". Each time these questions are answered, the physical properties of environment are different. However, the relational properties of I-you, here-there, and now-then remain constant across all exemplars. That is to say, the so-called deictic relations are an abstraction of an individual's perspective of the world and of others, in other words, deictic relations specify a relation in terms of the perspective of the speaker [4].

The first RFT study on perspective-taking in term of deictic relations was reported by Barnes-Holmes [5]. In this study, a testing and training protocol was developed for establishing the three deictic relations on the three levels of relational complexity (i.e., simple, reversed, and double reversed relational response) in young children. A simple relational response consists of relations in which none of the elements are reversed (e.g., "I-experimenter- am sitting here in a blue chair and you -participant- are sitting there in a black chair. Where are you sitting?"). In a reversed relational response, some of the elements are reversed (e.g., "If I were you and you were me, where would you be sitting?") and a correct response reflects this relational reversal (i.e., the experimenter is sitting in a black chair and the participant is sitting in a blue chair). In a double reversed relational response, two relations are reversed simultaneously (e.g., "If I were you and you were me and if here were there and there were here, where would you be sitting?") and a correct response would appear to require more complex derived relational activity (i.e., the experimenter would be sitting on the blue chair and the participant would be sitting on the black chair).

Many studies have investigated the RFT approach to perspective-taking through the Barnes-Holmes protocol [8–14]. Studies such as those by Heagle and Rehfeldt [15] or Rehfeldt et al. [11] improved perspective-taking skills by means of reinforcement contingencies during the training trials for correct responses on the deictic relational protocol. Others [10, 14] established the relationship between deictic framing and ToM skills. This protocol has also shown that deictic responding can help to understand clinical concepts such as social anhedonia or schizophrenia (e.g. [13, 16, 17]).

In recent years, the format of the original protocol has been modified in different studies. For example, the approach used in Davlin et al. [18] and in Gilroy et al. [19] was an extension of the Barnes-Holmes deictic framing protocol using a story reading context. These authors used more naturalistic story reading procedures from storybook materials, resources readily available to young children. Vilardaga et al. [20] created scenarios systematically developed on the basis of core deictic relations, although different from each other and suited for natural

language contexts. These studies have suggested that deictic relations should be presented in contexts similar to activities of daily life in order to facilitate generalization of perspective-taking ability. However, there is no published study to date that has investigated whether the modifications to the original Barnes-Holmes protocol improve deictic relational responding. McHugh et al. [7] compared four conditions to present the trials in the adult population (in written versus spoken form, and with visual aids versus no visual aids), but all conditions were based on the structure of the original Barnes-Holmes protocol.

The goal of this chapter was to compare different variations of perspective-taking protocol to assess deictic relational responding in children. The purpose of Study 1 was to determine if a protocol involving a set of contextual cues that were systematically different to each other and without necessarily using the exact words I-you, here-there, or now-then, would allow participants to more reliably identify responses based on the underlying deictic relations. If in fact the variability in the scenarios proposed by Vilardaga et al. [20] showed better performance for the Barnes-Holmes protocol, this would allow the development of a specific measure of deictic relation responding for children. The purpose of Study 2 was to analyze whether in fact performance with the Barnes-Holmes protocol improved due to the changes resulting from the previous study. In this last study the features of different conditions from Study 1 would be integrated in order to design a new deictic relational measure developed specifically to fit the childhood population.

2. Study 1

2.1. Participants

Twenty-three participants (14 girls and 9 boys) aged 6–7 years old were selected for participation in the experiment. All of the participants were typically developing students and they were recruited from a primary school. The consent of parents and teachers was sought prior to each child's participation. Criteria for participation included that neither their mainstream schoolteachers nor parents had identified them as having any learning difficulties. All of the children in this study were reported by their teachers to read at grade level, displayed no reading comprehension problems and an absence of disruptive behavior that could interfere with performing the tasks required.

2.2. Setting and material

The experiment was conducted in a quiet room free from distraction, located at the school which children attended. Participants were exposed to the experimental procedures individually in two sessions. Sessions could be terminated upon the child's request at any time (although this never occurred). The perspective-taking tasks consisted of different deictic relations protocols (explained in the Procedure) which included the three types of deictic frames (i.e., I-You, Here-There, and Now-Then) and the three levels of relational complexity (i.e., simple, reversed, and double reversed) used in the Barnes-Holmes protocol.

2.3. Design

A between subjects design was used to assess the effects of different perspective-taking protocol on the percentage of correct responses by both relational complexity and relation-type. The independent variable was made up of different formats of presentation deictic frames and it was made up of three levels (Condition 1–3 explained below). The measurement variables were performance on relational complexity, on relation-type and number of repetitions of trials.

2.4. Procedure

At the beginning of each session, participants were given the following instructions:

> *"I will ask you a number of questions. Your job is to listen to each task and tell me what you think is the correct answer to each question. If you do not understand any question or you need to hear the question once more, feel free to ask for the sentence to be repeated. I cannot tell you when you have answered correctly. So you should pay full attention. Do the best that you can".*

Participants were asked if they understood these instructions and then asked to begin. No participant indicated that they did not understand what was required.

2.4.1. Pretest

To assess the initial level for deictic relations in order to ensure all groups were at the same level, the participants completed a pretest measuring of perspective-taking abilities. The perspective-taking protocol contained a subset of the 18 trials (six per complexity level) used in the Barnes-Holmes protocol. Other studies [10, 14, 21] also used this short version of 18 trials for testing. This pretest protocol contained a random presentation of all three deictic relational frames across all three complexity levels. Each trial consisted of two questions (e.g., "Where am I sitting?/Where are you sitting?"). The actual questions depended on the type of relation being tested. After answering the first question, participants were asked the second question immediately. A correct response to a trial required that the participants answered both questions correctly. No visual aids and no feedback were provided for subjects' responses. The way of proceeding was as follows: the experimenter read all tasks aloud from the perspective-taking protocol, participants responded orally and the experimenter recorded each response. The researcher repeated a question twice, if requested to do so by a participant.

After the pretest sessions, participants were assigned to each of three conditions (five subjects in each condition) ensuring that groups were at the same level for deictic relation responding before the experimental condition was implemented. Although in all conditions the way to proceed was the same as for the pretest, the order of the presentation of the trials was randomized in a different sequence to the pretest protocol. This new sequence was the same for all conditions. If the participant requested, the researcher repeated a question a maximum of two times. Any form of corrective feedback was provided for participants' responses.

2.4.2. Conditions 1-2

Condition 1 and Condition 2 were similar to the protocol used in the pretest procedure, but now a range of visual aids were employed to facilitate responding to all of the tasks contained within the protocol. Nevertheless, the actual locations of the visual aids remain fixed in reversed and double reversed trials. For example, if the experimenter said "I am sitting here on the red sofa and you are sitting there on the white sofa", the experimenter had a picture of a red sofa and the participant had a picture of a white sofa. On other hand, if the experimenter said during a reversed trial "if I were you and you were me", the pictures did not change. These items included; two identically sized, differently colored pencils (one blue and one orange); two pictures of sofas (one red and one white); a picture of a pair of scissors; and a picture of a radio. It should be noted that the items were different to the pretest protocol (i.e., red and white sofas vs. black and blue chair). The purpose was to keep the same format as the Barnes-Holmes protocol, but using other stimuli.

Condition 2 was identical to Condition 1, but the length for Condition 2 was twice that of Condition 1, that is, 18 trials in Conditions 1 and 36 trials in Condition 2. This was done since in Condition 2 the two questions per trial were presented as separate trials. According to Lovett and Rehfeldt [22] and Weil et al. [14], the present study explored the hypothesis that a correct response to the first question in a trial could serve as a discriminative stimulus and facilitate a correct response on the second question of that trial. To control the second response and ensure that participants were responding according to the appropriate deictic relation for all questions, in Condition 2 the questions were presented as separate trials. However, in both Condition 1 and Condition 2 a correct response to a trial required that the participant answered both questions correctly. The sequential order of the last 18 trials in Condition 2 was the same as the first 18 trials. During sessions of Conditions 2, participants were given a break of 5 minutes after each 15 minutes of testing (or earlier if requested).

2.4.3. Condition 3

In contrast to Condition 1 and 2, in the protocol used in Condition 3, most of the trials did not necessarily include the actual words *I-you, here-there,* and *now-then.* An example of trial used in this Condition was as follows: "Last Sunday Julian was buying chewing-gum at the sweet shop and this morning he is cutting figures in the classroom. If this morning was last Sunday and if the classroom was the sweet shop, where would he be this morning?" (Full protocol may be obtained by writing to the principal author). As discussed by different authors [4, 6, 20], the terms *I-you, here-there,* and *now-then* refer to relational frames that must be functionally and not formally defined. Many phrases common in our daily life often include or replace words coordinated with particular individuals, places, and times (e.g., "It is 2 o'clock and I am eating [here and now], and Anne [you] is still in the school" [there and now]) [23]. From an RFT point of view, "Anne" or "she" may be functionally equivalent to "you" and "the school" may be functionally equivalent to "there." Furthermore, according to Vilardaga et al. [20], in Condition 3 not a single trial used the same content as any other trial. In other words, each trial used

names of objects, places, and scenarios that were different to each other. The purpose of this was so that participants were not distracted by the repetition of similar words and to develop a more natural evaluation of the relational responding involved in perspective-taking.

Although each type of trial involved two questions, in line with Vilardaga et al. [20] each question was separated into two equivalent trials. The trials were equivalent because they corresponded to the same deictic relations: simple I-you, simple here-there, simple now-then, reversed I-you, reversed here-there, reversed now-then, double reversed I-you/here-there, and double reversed here-there/now-then. The current protocol consisted of a battery of 36 scenarios, each with a corresponding question. As in the above mentioned Condition 2, the sequential order of the last 18 trials was the same as the first 18 trials.

Another key feature that differentiated this Condition from the Barnes-Holmes protocol was that each reversed and double reversed relation was separated indicating only the part of the reversal of each question. The aim of these modifications was to eliminate fatigue and to facilitate discrimination between reversal cue and double reversal cue. Understanding the difference between the last two levels of complexity of deictic relations requires complex conditional discriminations because the statements are very similar. For example, the sentence "if last Sunday was this morning and this morning was last Sunday" is more like "if last Sunday was this morning and this morning was last Sunday and if the sweet shop was the classroom and the classroom was the sweet shop" than "if last Sunday was this morning" versus "if last Sunday was this morning and if the sweet shop was the classroom". Separating reversal cue becomes more prominent for the differences between reversed and double reversed relations.

In a similar fashion to Vilardaga et al. [20], Condition 3 was presented in written form, although the experimenter also read all tasks aloud. In order to ensure that participants had sufficient reading comprehension skills, they previously read two short texts and answered two questions. The short texts would not be presented in the deictic relational protocol but had a similar format to the questions in Condition 3. Participants who did not answer both questions correctly were excluded (all of the children in the present study read at good level and displayed no reading comprehension problems).

2.5. Results

The percentage of correct responses for each participant in the Deictic Relations Pretest is presented in **Table 1**.

Table 1 shows that some participants made fewer mistakes on double reversed relations than reversed relations. However double relations can be considered to require the most complex form of relational responding from a theoretical point of view. These outcomes are consistent with other studies [11, 18], which suggest that the structure of the double reversed relations is such that a correct response can be given without engaging in relational responding if the participant is not able to detect the reversal cue. In other words, participants who do not discriminate between simple level and a more *complex level* of relational framing or the cue "If…then", can answer correctly both simple and double reversed relations.

	Simple			Reversed			Double Reversed	
Participant	I-YOU	HERE-THERE	NOW-THEN	I-YOU	HERE-THERE	NOW-THEN	I-YOU/HERE-THERE	HERE-THERE/NOW-THEN
1	50	50	100	50	0	100	66.67	66.67
2	100	50	100	50	0	50	66.67	66.67
3	100	50	100	0	0	50	66.67	66.67
4	100	50	50	50	0	0	33.33	100
5	50	100	100	50	0	50	33.33	33.33
6	50	50	0	50	0	0	0	100
7	50	100	50	100	100	50	100	33.33
8	100	0	100	50	100	100	0	33.33
9	100	0	100	0	50	100	66.67	33.33
10	100	100	100	0	0	50	66.67	33.33
11	100	50	100	100	50	100	66.67	33.33
12	100	100	50	0	50	0	66.67	66.67
13	50	100	50	0	0	50	66.67	66.67
14	100	100	50	100	50	50	33.33	66.67
15	100	50	50	50	100	100	33.33	33.33
16	100	100	100	100	100	50	33.33	66.67
17	50	50	50	100	50	0	66.67	33.33
18	100	100	100	100	50	100	33.33	66.67
19	100	50	50	100	100	50	66.67	66.67
20	100	50	100	50	0	0	33.33	33.33
21	100	50	100	100	100	0	66.67	33.33
22	100	50	0	50	0	0	33.33	33.33
23	100	100	100	100	100	50	0	33.33
24	50	100	0	50	0	50	100	0
Total	85.42	66.67	70.83	58.33	41.67	47.92	50.00	50.00

Note: Relations that reached 100% accuracy are shaded.

Table 1. Percentage of correct responses by relation type in pretest protocol.

Participants who demonstrated an overall accuracy rate below 65% across simple trials were removed from the analyses (see **Table 1**). According to this criterion, four participants were removed from the final analysis (they were participants 6, 17, 22, and 24), resulting in a total sample of 20 participants. Vilardaga et al. [20] and Villatte et al. [13] used a similar criterion as a control for participants who were likely to be randomly responding and therefore not engaging in the task.

In order to ensure all groups were at the same level of deictic relational responding before implementing the different conditions, they were formed following a set of specific criteria: (1) participants who exceeded only 65% of correct simple trials; (2) those who exceeded 80% of correct simple trials, but failed 80% of reversed relations; (3) those who exceeded 80% of correct simple and reversed trials, and (4) those who exceeded only 80% of reversed trials. **Table 2** shows the final composition of groups. Due to double reversed relations being considered to require the most complex form of relational responding, and given the age of the participants, this level of complexity was not taken into account for the formation of groups.

The groups 1, 2 and 3 were assigned to Conditions 1, 2 and 3, respectively. The mean percentages of correct response and standard deviations in term of Condition and relational complexity are presented in **Table 3**. With regard to Condition 3, although in the original Vilardaga et al. [20] protocol each trial or scenario only had one question, a correction criterion similar to Condition 2 was additionally adopted to check if variability of scenarios would maintain the results even when separating the questions. For this reason, Condition 3 was marked in two different ways. In the first one, Condition 3a, each question per trial was marked as separate trial. That is to say, each question was taken into consideration independently of the other correct one. Although each type of trial had two questions separated into two different trials, a correct response to a trial did not require that the participant answered both questions correctly. The second one, Condition 3b, was similar to Condition 2. A correct response to a trial required the participant to answer both questions correctly. As such, the two questions were marked as one single trial. In short, Condition 3a was marked as if it had 36 trials, while Condition 3b was marked as if it had 18 trials.

In general, the data indicate that correct answers decrease as a function of relational complexity (see **Table 3**). Particularly, the best performance on the simple and on reversed relations was achieved in Condition 1, however it underwent a sharp decline for the double reversals. The best

Group	Participants	Simple		Reversed		Double Reversed	
		Mean Percentage Correct	Standard Deviation	Mean Percentage Correct	Standard Deviation	Mean Percentage Correct	Standard Deviation
1	1, 5, 12, 16, 7	80	13.94	53.33	29.81	56.67	19.91
2	9, 2, 20, 18, 15	80	13.94	53.33	29.81	46.67	13.95
3	13, 10, 21, 11,19	80	13.94	53.33	34.15	56.67	9.13

Note: The order in which participants of each group are displayed in the table corresponds to the order of specific criteria displayed in the text. For example, participant 1 is equivalent to participants 9 and 13 because they reached the first criterion.

Table 2. Composition of the groups and mean percentage of correct responses by relational complexity in each group.

	Simple		Reversed		Double Reversed	
	Mean Percentage Correct	Standard Deviation	Mean Percentage Correct	Standard Deviation	Mean Percentage Correct	Standard Deviation
Condition 1	90.00	14.90	80.00	13.94	16.67	20.41
Condition 2	70.00	21.73	43.33	22.36	10.00	14.91
Condition 3a	86.67	13.94	71.67	16.24	20.00	7.45
Condition 3b	80.00	21.73	60.00	22.36	10.00	9.13

Note: The best result for each relational complexity is shaded.

Table 3. Means and standard deviations for relational complexity in each condition.

performance for double reversed relations was achieved in Condition 3a. Condition 2 produced the weakest performances for all levels of relational complexity. Both Condition 1 and Condition 3a/b achieved better results on simple and reversed relations than pretest (see **Tables 2** and **3**), but both Conditions performed worse for double reversed than pretest. A possible reason for this may be that the participants were able to detect the reversal cue on double reversed with these Conditions versus pretest procedure, but they did not have sufficient ability to answer in accordance with double reversed. In other words, compared with responding to double relations as if they were simple relations, during Condition 1 and Condition 3a/b the participants responded as if double reversed relations were reversed relations.

Comparison of means between the three conditions was performed using non-parametric tests (Mann-Whitney U). Since the sample size was small and assumption of normality is not met, it was decided to use non-parametric tests. According to relational complexity, the differences between Condition 1 and Condition 2 ($p < 0.02$) as well as Condition 2 and Condition 3a were significant ($p < 0.05$) in reversed relations. For all other comparisons, the differences were non-significant.

With regards to the different ways of marking in Condition 3, when the questions were taken into consideration independently of each other for marking (i.e., Condition 3a), Condition 3 achieved better results than when the two questions per trial were marked as one single trial (Condition 3b). However, the differences were non-significant. Furthermore, Condition 3b achieved better results than Condition 2, which was marked in the same way.

The results for relation type for all Conditions are presented in **Table 4**. The number of correct responses on I-YOU/ HERE-THERE double reversals in Condition 2 was zero. The data indicated that Condition 1 achieved the best performance for all types of simple relations, as well as I-YOU reversed relations and NOW-THEN reversed relations, but on HERE-THERE

	Simple			Reversed			Double Reversed	
	I-YOU	HERE-THERE	NOW-THEN	I-YOU	HERE-THERE	NOW-THEN	I-YOU/ HERE-THERE	HERE-THERE/ NOW-THEN
	M (SD)	*M (SD)*	*M (SD)*	*M (SD)*	*M (SD)*	*M (SD)*	*M (SD)*	*M (SD)*
Condition 1	100 (0)	90 (22.36)	80 (44.72)	100 (0)	70 (27.39)	70 (27.39)	6.67 (14.9)	26.67 (27.89)
Condition 2	90 (22.36)	80 (27.39)	40 (41.83)	80 (27.39)	30 (27.39)	20 (27.39)	0	20 (29.81)
Condition 3a	100 (0)	90 (13.7)	70 (32.6)	70 (32.6)	90 (13.7)	55 (20.92)	13.33 (13.94)	26.67 (9.13)
Condition 3b	100 (0)	80 (27.39)	60 (41.83)	60 (41.83)	80 (27.39)	40 (22.36)	6.67 (14.9)	13.33 (18.25)

Note: The best result for each relational type is shaded.

Table 4. Means and standard deviations for relational type in each condition.

reversed relations it did not. In this case, Condition 3a achieved the highest score. Regarding to double reversed relations, Condition 3a achieved the best performance for these two types of these relations.

Non-parametric tests (Mann-Whitney U) revealed significant differences between Condition 1 and Condition 2 in NOW-THEN reversed relations (<0.04), between Condition 2 and Condition 3a in HERE-THERE reversed relations (<0.01), and between Condition 2 and Condition 3b in HERE-THERE reversed relations (<0.04).

In connection with the number of trials being repeated per condition, Condition 3 was the only one in which no trial was repeated. Furthermore, in Condition 1 and 2 some participants asked whether the trial had been done before (e.g. "but you have already asked me this question before", "I don't understand why you are asking me again", "Did I make a mistake? Because you are asking me that question again").

The results from Condition 1-3a/b can be discussed as follows. Condition 1 relinquished first position when the two questions per trial were presented as separate trials (see Condition 2 in **Tables 3**, **4**). These findings are consistent with the results of other studies [14, 22], and they confirmed our initial hypothesis that a correct response to the first question of a trial could serve as a discriminative stimulus and facilitate a correct response for the second question of that trial.

Overall, Condition 3 finished in first or second position for the majority of relation types (see **Table 4**). However, it gave the weakest performances on I-YOU reversed relations. It should be recalled that the structure of the I-You relations in Condition 3 can be described as Other-Other relations because the trials enquiring about the perspective of the characters included in the scenario. According to Lovett and Rehfeldt [22], it could be that Other-Other relations are a

more *complex level* of deictic relations because the participant must first change perspective from I to You in order to then change perspective from You to Other. That is to say, I-You frame would be a prerequisite relation in order to be able to respond to an Other-Other relation. The same could happen on NOW-THEN relations. As is the case of Vilardaga et al. [20], this condition used more *complex temporal* relations than today-yesterday (i.e., 3 h ago, this morning, right now, last Sunday, next Summer…). *According to* Hayes et al. [4], *abstracting relational responding along temporal comparatives is a highly verbal action. Hayes, Fox, Gifford, Wilson, Barnes-Holmes and Healy [24] asked how "the future" can be presented, meaning that* time is inherently more abstract. Due to the fact that temporal frames tend to emerge later in development, more *complex temporal concepts could make performance for* temporal deictic relations *worse.* Contrary to the abstraction used in temporal relations, HERE-THERE relations in Condition 3 were represented by specific natural contexts (e.g., Margarita is buying some drinks in the supermarket and Victoria is studying in the English school). According to the outcomes, the HERE-THERE reversed relation (i.e., if here was there) could require a more abstract ability than specific place reversed (i.e., if the supermarket was the classroom). This could be a possible reason for the better results the HERE-THERE reversed relation achieved in Condition 3.

The present study suggests that the variability between scenarios allows for the fact that the participants are not distracted by the repetition of similar words and to facilitate deictic relational responding. These results are consistent with those in Vilardaga et al. [20]. However, although the protocol used in Condition 3 was an adaption developed specifically to fit a child population from Vilardaga et al. [20], Study 1 shows that some scenarios could be too complicated for the sample used. Perhaps the verbal repertoire of this age group was not sufficiently developed to allow deictic relational responding with more complex concepts. For example, the *temporal concepts used may not be suitable for early or middle childhood. The purpose of Study 2 was to adapt the variability on trials to especially fit a childhood population.*

3. Study 2

With regard to the performances observed in Study 1, the current study was designed to determine whether a specific deictic protocol, maintaining the structure of the I-YOU and NOW-THEN relations in Condition 1, but following the variability in scenarios developed by Vilardaga et al. [20], would facilitate the participant's relational performances.

3.1. Participants

Five typically developing children with no known disabilities participated in this study (3 girls and 2 boys). They were carried over from Study 1 and were selected from the pretest procedure in the previous study. Since the participants have been evaluated in the Pretest of the previous study, consent is already available authorizing their participation. The school and the recruitment procedure were the same as Study 1. These children had not participated in any of the conditions of Study 1.

3.2. Setting and material

The setting used in Study 2 was identical to that employed in Study 1. The specific protocol designed for this Study is explained below.

3.3. Design

Similar to Study 1, a between subjects design was used to assess the effects of different perspective-taking protocols on the percentage of correct responses by both relational complexity and relation-type. The comparisons were made between the condition in Study 2 and the conditions in Study 1. The independent variable was the format of presentation in deictic frames. The measurement variables were: performance on relational complexity, on relation-type and number of repetitions of trials.

3.4. Procedure

At the beginning of each session, participants were given the same instructions as Study 1. The experimenter read all tasks aloud from the perspective-taking protocol, the participant responded orally and the experimenter recorded each response. The order of the presentation of the different trials was identical to that employed in all conditions in Study 1. As in previous conditions, no corrective feedback was provided for participants' responses.

This study was in keeping with the philosophy of the Vilardaga et al. [20] study, in which scenarios were created differently to each other. The trials were randomly selected from Condition 3 of Study 1, however the contexts were simplified in order to make it easier to respond under the control of deictic contextual cues (full protocol may be obtained by writing to the principal author). In addition, the exact terms I-You and Now-Then remained constant in line with Condition 1 of the previous study. Another key feature that differentiated this study from Condition 3 in Study 1 was that now a range of visual aids were employed to facilitate responding to all of the tasks contained within the protocol. This protocol was not presented in written form. The visual aids included pictures all different to each other, such as a bicycle, skates, a classroom, a theater and an ice-cream, amongst others. For example, if the experimenter said "I am at a bakery and you are at a sweetshop" the experimenter would have a picture of a bakery and the participant would have a picture of sweetshop. These modifications were made in order to involve the participant in more realistic contextual cues than in Condition 3. Seeing and holding the photos provided a more realistic representation than reading the sentence. In a similar fashion to Condition 1 and Condition 2, the actual locations of the visual aids remain fixed in reversed and double reversed trials.

The length of this protocol was 18 trials, including trials containing all three frames and the three levels of complexity. Due to the differences between Condition 3a and Condition 3b in the previous study being non-significant, each trial of Study 2 consisted of two questions in line with Condition 1, in order to minimize the assessment times. After answering the first question, participants were asked the second question immediately. A correct response to a trial required that the participants answered both questions correctly. In line with Condition 3

in Study 1, in order to discriminate between reversed and double reversed relations, as well as to eliminate fatigue because of sentences being too long, each reversed and double reversed relation was separated, indicating only the part of the reversal of each question (i.e., If the park was the aquarium, where would I be?; If the aquarium was the park, where would you be?).

3.5. Results

In order to ensure the group was at the same level as participants from Study 1, before implementing the Condition, the participants were selected in accordance with the set of specific criteria mentioned above. **Table 5** shows the final composition of the group.

Figure 1 shows the percentage of correct responses in terms of Condition and relational complexity. It can be seen from the figure that participants in Study 2 gave more correct responses than other Conditions in Study 1 on all levels of complexity (M = 100, SD = 0; M = 90, SD = 14.91; M = 26.67 SD = 14.91,on simple, reversed, and double reversed relations, respectively).

Participants	Simple		Reversed		Double Reversed	
	Mean Percentage Correct	Standard Deviation	Mean Percentage Correct	Standard Deviation	Mean Percentage Correct	Standard Deviation
4,3,14,23, 8	80.00	13.94	53.33	34.15	43.33	25.28

Table 5. Means and standard deviations by relational complexity in pretest.

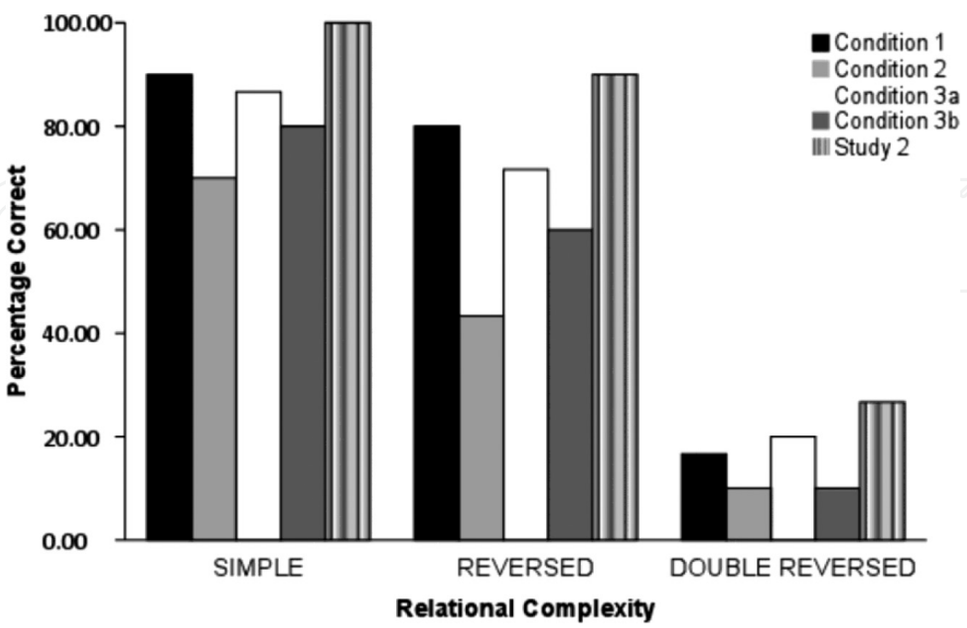


Figure 1. Mean percentage of correct responses for each condition in simple, reversed and double reversed relations.

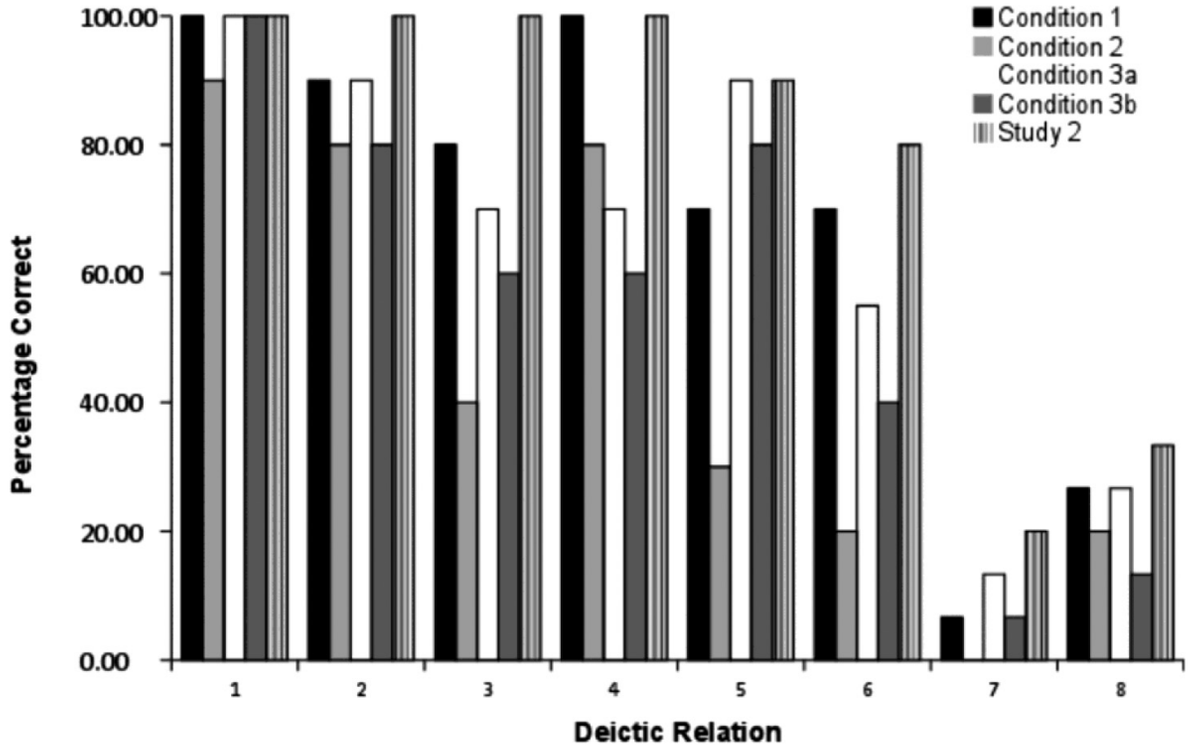


Figure 2. Mean percentage of correct responses for each condition by relation type.

Comparison of means between conditions in Study 1 and the condition in Study 2 were performed using non-parametric tests (Mann-Whitney U). According to relational complexity, the differences between Study 2 versus Condition 2 ($p < 0.02$) and Study 2 versus Condition 3b were significant ($p < 0.05$) in reversed relations. For all other comparisons, the differences were non-significant.

The results for relation type from all Conditions in Study 1 and Study 2 are presented in **Figure 2**. The number of correct responses in I-YOU/ HERE-THERE double reversals in Condition 2 was zero. The data indicated that participants in Study 2 achieved the best results for all relation types compared with Condition 1–3 in Study 1.

Non-parametric tests (Mann-Whitney U) revealed significant differences between Condition 2 and Study 2 in NOW-THEN simple relations (<0.02), in HERE-THERE reversed relations (<0.02) and in NOW-THEN reversed relations (=0.02); and between Condition 3b and Study 2 in NOW-THEN reversed relations (<0.05).

In connection with the number of repetitions of trials, it is also worth emphasizing that it was not necessary to repeat any trials for the condition in Study 2.

4. General discussion

From the RFT account, perspective-taking involves complex patterns of derived relational responding in accordance with the deictic relational frames of I-you, here-there, and now-

then. As noted in the introduction, many studies have investigated the RFT approach to perspective-taking through the Barnes-Holmes protocol and, in recent years, the format of the original protocol has been modified in different studies. However, no published study to date has compared the performance in the original protocol with new perspective-taking protocols. This approach was adopted in the current study with a view to analyzing differences between the original Barnes-Holmes protocol and an adapted protocol which included different scenarios and adaptations of reversal cues.

The results of both Study 1 and Study 2 indicated between-group differences with regard to variations in the format of protocol in terms of performance accuracy. Our ability to draw firm conclusions from these findings is limited because of the small sample size. Nonetheless, some interesting trends were apparent in the data, the most important being the role of stimuli variability between trials in the perspective-taking protocol. The difference in the number of correct responses for both relational complexity and relation type between conditions in Study 1 and Study 2, suggest the repetition of similar words developed by Y. Barnes-Holmes [5] could cause fatigue and lack of interest for the task. After listening to the words *black chair* and *blue chair* many times, participants become confused and lose interest. On the other hand, whereas Condition 3 in Study 1 or our deictic protocol in Study 2 did not need to repeat any trials, the Barnes-Holmes protocol of the Conditions 1–2 required more than 10 repetitions. These differences in number of repetitions requested by participants could be due to the fact that in the Condition 3 and Study 2, each trial presented a new and unique scenario, making the task less cognitively demanding. As mentioned earlier, for Conditions 1 and 2 in Study 1 some participants did not understand why the same trial was being done again. These findings are consistent with recent extensions of deictic teaching procedures which incorporate different and more naturalistic contexts with the purpose of bringing them in line with everyday discourse [18, 19, 22].

Although the findings from both studies are consistent with those of Vilardaga et al. [20] because a set of contextual cues that were systematically different to each other allowed participants to more reliably identify responses based on the underlying deictic relations, different changes were carried out to Study 2 to specifically fit a childhood population. The exact terms I-you and now-then remained constant in line with the original Barnes-Holmes protocol. Consistent with Lovett and Rehfeldt [22], evoking I-you framing response based on different personal deictic cues, required a more complex ability in derived relational responding. On the other hand, as discussed above from a RFT point of view [4], responding to temporal relations implies responding relationally to a situation where the relation is defined not by the physical properties, but by some other feature of the situation. Abstracting the physical dimension of concepts such as yesterday, tomorrow, or next week, requires highly verbal actions. For this reason, temporal frames of deictic protocols should be adapted to the verbal repertoire of children. These results support the need for adaptation of the assessment tools to the population targeted, raising important issues that should be addressed in future research.

Limitations of the current study should also be considered. Sample size and number of trials by protocol are too small to establish strong conclusions. The protocols designed are part of a bigger research project in which children are being trained in perspective-taking via deictic relations. The protocols of the present study should be considered as screening tools, not

training protocols. As previously mentioned, other studies [10, 14, 21] also used a short version of the 18 trials for testing. Future work with larger samples and protocols is needed to clarify this issue. Despite these limitations, the current paper seems to lend support to further elaborations of the protocol originally developed by Y. Barnes- Holmes [5] for the specific target population, i.e. typically developing children. Summarizing the results of present study, variability between scenarios, more natural and familiar contexts, direct interpersonal deictic relations (I-You versus Other-Other), specific locations for spatial relations, and non-complex temporal relations, seem to be key features for improving the children's performances. These findings support the idea of developing measures of perspective-taking from an RFT approach aimed at facilitating generalization towards other tasks or everyday contexts.

Author details

María M. Montoya-Rodríguez[1]* and Francisco J. Molina Cobos[2]

*Address all correspondence to: maria.montoya@ucu.edu.uy

1 University Catholic of Uruguay, Montevideo, Uruguay

2 University of Almeria, Spain

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