PSYCHOLOGIA ROZWOJOWA, 2021 ∗ tom 26, nr 1, s. 49–61
doi:10.4467/20843879PR.21.004.14118
www.ejournals.eu/Psychologia-Rozwojowa

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The Role of Speech Comprehension in the Early Stages of Theory of Mind Development in Children with ASD

Abstract. In order to determine whether the reported association between the development of *theory of mind* (ToM) and speech comprehension in ASD children also exists at the early stages of ToM development, a group of 33 children with ASD and reduced ToM development were tested using the *Belief understanding* subscale of the *SToMM* and the *Speech comprehension* subscale of the *IDS-P*. The statistical analyses demonstrated that children with ASD presenting different levels of early ToM skills also have different levels of speech comprehension. Accordingly, supporting the development of speech comprehension can facilitate the acquisition of early ToM skills. At the same time, the results of a qualitative analysis also suggested that manipulating objects in space, moving them as well as moving themselves may help children with ASD to complete ToM tasks.

Keywords: autistic spectrum disorder (ASD), *theory of mind*, speech comprehension

Słowa kluczowe: zaburzenia ze spektrum autyzmu (ASD), *teoria umysłu*, rozumienie mowy

INTRODUCTION

The diagnostic criteria for autistic spectrum disorder (ASD) used by the DSM 5 (American Psychiatric Association, 2013) and ICD 11 (World Health Organization, 2018) were created taking into account the wide diversity of persons with ASD frequently stressed by practitioners and researchers (Frith, 2012; Wilson et al., 2013). The core ASD criteria were adopted from the earlier classifications of pervasive developmental disorders (DSM IV TR [American Psychiatric Association, 2000] and ICD 10 [World Health Organization, 1992]) but their number was reduced from three to two diagnostic blocks: a) deficits in social communication and social interaction; b) restrictive, repetitive patterns of behavior, interests or activities (American Psychiatric Association, 2013).

The reason for including the word 'spectrum' in the phrase "autistic spectrum disorder" was the

intent to acknowledge the diversity of the ASD population in terms of the severity of the core symptoms, developmental patterns, gender, concomitant disorders, genetic correlates and cognitive profiles (Frith, 2012; Wilson et al., 2013). Researchers argue (Frith, 2012; Lai et al., 2013; Wilson et al., 2013) that given the lack of medical indicators, the cognitive profiles of persons with ASD provide a reliable basis for observing differences between them.

Studies of why persons with ASD differ in the development of cognitive and social skills can provide valuable insight into what factors are behind the process, as well as highlight the are as that need special attention from therapists and teachers. Especially useful in this respect seem to be the studies of *theory of mind* (ToM), the deficit of which is reported to be a distinctive feature of persons with ASD. ToM is an ability that allows individuals to see a relation between their actions and the actions of other people and their mental states (Baron-Cohen, 2005), and consequently to explain and predict future actions (Białecka-Pikul, 2012). ToM requires different skills that are acquired in the same sequence by typically and atypically developing children during the ontogenic development (Baron-Cohen, 1995; Baron-Cohen, 2005).

Having conducted a meta-analysis of over 100 studies on typical individuals, Milligan et al. (2007) reported that the development of ToM is significantly influenced by all language functions (general language skills; semantic, syntactic and passive vocabulary skills; sentence memory).

It is also worth noting that the way in which the experimenter asks the question when investigating the understanding of false beliefs significantly modifies the responses of those test children whose *theory of mind* is in the early stages of development (He et al., 2012; Rubio-Fernandez, Geurts, 2013).

Such findings suggest that speech understanding may be particularly important for the development of *theory of mind.*

Similar conclusions were reached by authors investigating the course of ToM development in ASD subjects (McGregor et al., 2013; Pedreño et al., 2017). According to their findings, lower language skills of persons with ASD impede their acquisition and comprehension of information that can help them navigate social situations. Among the authors are also Peterson et al. (2015), who demonstrated that in the case of persons with ASD language skills mediate between the development of *theory of mind* and that of social competencies.

It needs to be noted, however, that most studies looking at ToM factors and their development in adults and children with ASD focus on their ability to understand false beliefs, only rarely trying to analyze earlier stages of ToM development, such as visual perspective taking, the *seeing leads to knowing* rule, or predicting another's behavior based on a mental state (Hadwin et al., 1996). It is also notable that many of the studies involve high-functioning ASD subjects (whose mental and chronological ages are similar, and who have average language skills).

No study has been undertaken to investigate factors enabling persons with ASD to sequentially progress through the stages of ToM. Due to the lack of research data, it is not possible to establish whether the language skills of persons with ASD are only associated with their ability to understand false beliefs (Joseph, Tager-Flusberg, 2004) or, perhaps, with earlier abilities as well. Whether persons with ASD at the early stages of belief understanding use perceptual-cognitive analyses as compensation strategies like the high-functioning persons has not yet been explained either (McGregor et al., 2013; Pedreño et al., 2017).

From the perspective of practitioners providing ToM training for persons with ASD, especially useful seem to be studies investigating relations between the early stages of ToM development and the speech comprehension. Persons with ASD have been found to have a particular difficulty understanding speech because their attention goes to the external characteristics of a verbal message (e.g., suprasegmentals) rather than to its content (meaning) and, consequently, it has them miss its social context (Boucher et al., 2008; Mody, Belliveau, 2013). Therefore, it is possible that speech comprehension plays a key role in the acquisition of early social skills, including ToM skills.

Considering the above, this study was designed to determine whether the speech comprehension is a differentiating factor in the level of early ToM skills in children with ASD. The following research question was sought to be answered:

Question 1. How do preschoolers and early school-age children with ASD and reduced ToM differ in speech comprehension depending on the stage of development of early ToM skills?

If the ability to understand false beliefs, which is a more advanced ToM skill, and well developed language competence co-occur in children with ASD (Joseph, Tager-Flusberg, 2004), it is likely that such a relation also occurs at the earlier stages of ToM development. As a result, the following hypothesis was formulated:

H1: Children with ASD and lower early ToM skills exhibit lower speech comprehension as well.

Some of the children invited to participate in the study successfully completed higher level ToM tasks despite failing the earlier tasks. This course of ToM development was found to be atypical, because developing children typically acquire ToM skills sequentially, without skipping any one of them.

This observation prompted questions about the reasons for skipping some levels in ToM development. Is it a speech comprehension deficit that causes some early stages in ToM development to be skipped over? Or, perhaps, some other factor is at play? In seeking to answer these questions, an analysis of the research results was conducted separately for children with typical and atypical ToM, and an additional research question was formulated – the need for which could not be foreseen beforehand.

Question 2. How do preschoolers and early school-age children with ASD and reduced ToM differ in speech comprehension depending on whether their ToM is typical or atypical?

As mentioned earlier, the ability of children with ASD to understand false beliefs occurs in tandem with higher language skills including the speech comprehension ability (Joseph, Tager-Flusberg, 2004). This suggests that children with atypically developing ToM (i.e., capable of recognizing false beliefs despite having failed to acquire earlier skills) understand speech better than children with typically developing ToM, who do not progress beyond its early levels. If the presumption is true, a good speech comprehension would be necessary for the early ToM skills to be acquired, as well as some other ability that children with atypical ToM do not have. Them acquiring higher ToM skills without developing lower ones suggests that the absent ability is compensated for by the good speech comprehension.

Based on the above, the second hypothesis was formulated:

H2: In the group of preschoolers and early school-age children with ASD and reduced ToM, children with atypical ToM understand speech better than those with typical ToM.

METHODS

Participants

Typically developing children start understanding false beliefs at the age of 5, although reports of children as young as 3 years old completing false belief understanding tasks exist (Wellman et al., 2001). Children with ASD acquire the ability with a delay of around 5 years (Happé, 1995).

This study involved 33 children with ASD and reduced ToM, aged from 3 years and 7 months to 8 years and 11 months, who scored ≤ 4 points (out of 5 possible) on the *Belief understanding* subscale of the *Theory of Mind Mechanism Scale (SToMM)*. Neither the level of speech comprehension nor the mental age were used as the inclusion criteria.

Among the children were 26 boys (78.8%) and 7 girls (21.1%). A similar ratio of 4 : 1 is observed for the general ASD population (Baird et al., 2006). Thirty-one children (94%) had autism diagnosis and the other 2 (6%) were diagnosed with Asperger's syndrome. More than half of the children (57,6%) communicated verbally; the others (42,4%) used only alternative non-verbal methods of communication (e.g., PCS, PECS, and MAKATON).

Materials

The research tools selected for the study were the *Belief understanding* subscale of the *SToMM* created by Howlin, Baron-Cohen and Hadwin (1999) and adapted by Krzysztofik (2016);the *Speech comprehension* subscale of the *Intelligence and Development Scales – Preschool (IDS-P)* authored by Grob et al. (2013) and translated into Polish as well as adapted by Fecenec, Jaworowska and Matczak(2015), and a sociodemographic questionnaire.

The *SToMM* is an experimental tool designed on the basis of the mindreading course for autistic children created by Howlin et al. (1999). Its three subscales enable the ability to recognize emotions, the ability to understand beliefs, and the ability to pretend play to be measured (Krzysztofik, 2016).

The children's ability to understand beliefs was evaluated based on their performance of tasks at five levels of the *Belief understanding* subscale: 1) *Simple Visual Perspective Taking* (3 trials), 2) *Complex Visual Perspective Taking* (3 trials), 3) *Understanding of the "seeing leads to knowing" rule* (3 trials), 4) *Understanding of true beliefs/action prediction* (3 trials), 5) *Understanding of false beliefs* (3 trials). The children were tested using simple pictures of objects and animals (e.g., a telephone, an elephant), toys (e.g., a big rag doll called Krzyś, the Lego figures of a boy and a girl), and some everyday objects (e.g., an empty tablet packet, buttons). In order to be considered to have reached a given level (between 1 and 5), a child should correctly solve all three tasks at that level. Because a child received 1 point for each level passed, the total score could range between a minimum of 0 points (unable to understand beliefs) and a maximum of 5 points (capable of understanding false beliefs). A detailed description of the tasks and materials used can be found in the Annex.

Speech understanding in the studied group was measured using the *Speech comprehension* subscale, which contains twelve tasks described by instructions of different complexity. A task consisted of the experimenter reading aloud a sentence such as "A boy jumps up on the kennel" and the child acting it out using the right toys (selected from a set comprising a dog, a cat, a boy, a girl, a cat basket, a kennel and a tree). The number of points a child could achieve for each task was 0, 1 or 2, so the total score for all 12 tasks could range from 0 to 24 points.

The sociodemographic questionnaire was distributed to be completed by the parents and served as a source of information about the children's characteristics.

Procedure

Children were enrolled in the study with the consent of their parents or guardians. Individual testing sessions were conducted in the children's kindergartens, therapeutic centers or schools; in rooms they were familiar with (e.g., the school counsellor's office, the speech therapist's office or the school lounge). The experimenter conducting the sessions was one of the paper's authors, a psychologist and a therapist with long experience in working with children and adolescents with ASD.

Results

The statistical analysis of the children's performance will be presented in the following order: 1) an analysis of the differences in speech comprehension level in children with ASD and different levels of reduced ToM, 2) an analysis of speech comprehension differences between children with typical and atypical ToM development.

An analysis of the differences in speech comprehension level in children with ASD and different levels of reduced ToM

Table 1 show the children's mean scores on the *Belief Understanding* and Speech comprehension subscales.

The numbers in Table 1 allow two conclusions to be drawn. Firstly, the children generally lacked the skill of simple visual perspective taking, which is a prerequisite to understanding beliefs. Secondly, their ability to understand speech was comparable with that observed among children aged 3 years and 3 months (Table 1).

Table 1. The mean scores (M) and standard deviations (SD) of children with ASD and reduced ToM skills on the *Belief understanding* subscale of *SToMM* and *Speech comprehension* subscale of *IDS-P*

	M	SD
Belief understanding subscale of *SToMM*	.91	.98
Speech comprehension subscale of *IDS-P*	10.52	1.08

In order to take a closer look at the relation between speech comprehension and *theory of mind* in the group of studied children, it was decided to conduct more detailed analyses of the scores achieved on the *Speech comprehension* subscale of the IDS-P scale by children presenting different levels of belief comprehension.

The distribution of these results is presented in Table 2. Data on differences in speech comprehension between children presenting various level of belief comprehension are presented in Table 3.

Children presenting no skill in belief comprehension (their *SToMM* score is 0) on the IDS-P *Speech comprehension* subscale scored between 0 and 22, a median score of 3. A similar spread of speech comprehension scores is presented by children with belief understanding levels 1 and 2 (between 2 and 24). The median in these subgroups varies and is 10 and 19, respectively. None of the examined children presented understanding of beliefs at levels 3 and 5. Only one child reached a level 4 in this area. His speech comprehension score was 22 (Table 2). The size of the subgroups allowed the comparisons in terms of level of speech comprehension to be made only between subgroups of children reaching level 0, 1 and 2 in terms of belief understanding. The median test showed that the speech comprehension of children who did not present any skill in the area of belief understanding is significantly lower than that of children whose level of belief understanding development corresponds to level 1 and 2. Speech comprehension is a differentiating factor between subgroups of children with ASD with no manifestation of belief understanding and those presenting development of this skill at different levels. In contrast, it is not a differentiating factor between subgroups of children who have understanding of beliefs already developed at different levels (Table 3). Accordingly, hypothesis H1 has been partially validated.

Thus, speech comprehension may be a skill that is important in the initial stages of acquiring belief understanding skills. It may play a less important role in achieving of the successive stages in the development of this skill.

Further suggestions about the role of speech comprehension in the development of the different stages of belief understanding may be provided by answering the second research

Table 2. Count, median, score minimum and maximum for results in IDS-P *Speech comprehension* achieved by children presenting individual levels of belief understanding

SToMM total score	IDS-P *Speech comprehension*
0	N = 14 Med = 3 Min = 0 Max = 22
1	N = 10 Med = 10 Min = 2 Max = 24
2	N = 8 Med = 19 Min = 2 Max = 24
3	–
4	N = 1 score = 22
5	–

Table 3. Test of significance of differences for results in IDS-P *Speech comprehension* achieved by children presenting individual levels of belief understanding

SToMM total score	Median test	p
0 vs 1	7.726	.010
0 vs 2	15.086	.000
1 vs 2	.748	.630

question. It is concerned with the variation in level of speech comprehension in children with typical and atypical development of belief understanding.

An analysis of speech comprehension differences between children with typical and atypical ToM development

To answer the second question about how typical and atypical ToM development contributes to speech comprehension differences among preschoolers and early school-age children with ASD and reduced ToM, statistical calculations were performed. Their results are compiled in Table 4.

Due to the insufficient size of the group of studied children, the test of significance of differences between the levels of speech comprehension could be calculated only for two levels of ToM development (levels 1 and 2) (Table 4).

Children with atypical ToM development presenting level 1 or 2 of its development, reached the maximum score (with a jump of one or two levels) corresponding to level 4 or 5. Nevertheless, children with typical and atypical ToM development reaching equal stages of it (1 or 2) do not significantly differ statistically in terms of speech comprehension (Table 4).

The above analyses therefore undermine the validity of hypothesis 2. It can be concluded that good speech comprehension is not the factor that plays an important role in the atypical development of belief comprehension. So it is not the good speech understanding but another skill that compensates for the difficulties of children with ASD in reaching the next stages in the development of *theory of mind*.

Analyses of the ways in which high-functioning individuals with ASD and typically developing children under the age of 4 solve *theory of mind* tasks may provide some insight into which skill is responsible for such compensation. High-functioning persons with ASD employ compensation strategies (e.g., a perceptual-cognitive analysis) to pass ToM tasks (McGregor et al., 2013; Pedreño et al., 2017).

Young children (under the age of 4), on the other hand, attempt to modify their own egocen-

Table 4. The number, median, and minimum and maximum scores for IDS-P *Speech comprehension* obtained by children with typical and atypical belief understanding development at different levels of belief understanding development and the significance of differences between them

SToMM total score	IDS-P *Speech comprehension*		Median test	p
	Atypical ToM development	Typical ToM development		
0	–	N = 14 Med = 3 Min = 0 Max = 22	–	–
1	N = 2 Med = 17 Min = 10 Max = 24	N = 8 Med = 8 Min = 2 Max = 24	.104	.747
2	N = 4 Med = 23 Min = 10 Max = 24	N = 4 Med = 16 Min = 12 Max = 24	2.00	.486
3	–	–	–	–
4	–	N = 1 score = 22	–	–
5	–	–	–	–

tric mental representations when solving *theory of mind* tasks (Grosse, Wiesmann, Southgate, 2021). They only manage to achieve this in the instance of participating in an event. They cannot make such modifications when they are merely witnessing an event.

It may be possible that similar strategies, although less complex, are also used by their low functioning counterparts with ASD (e.g., involving spatial manipulations, attempts at active participation, "role playing" in tasks requiring *theory of mind*). The studies so far do not provide sufficient data to verify this assumption. Qualitative analyses of the ways in which the two children studied performed the tasks may to some extent support the validity of this supposition.

A qualitative analysis of two children's performance of selected belief understanding tasks

Two children (Daniel aged 6 years and 1 month and Filip aged 8 years and 11 months) performed some of the tasks differently than other children (Daniel: one of the level 5 tasks; Filip: one of the level 2 tasks). The analysis of their performance was conducted to learn more about the development of belief understanding in children with ASD. A detailed description of the tasks can be found in the Annex.

Daniel's performance of one of level 5 tasks

Even though Daniel listened carefully to the story told by the experimenter, he was unable to show where Kasia would seek her watering can that was hidden by Bartek while she was gone. The second task involving a drug box with colored pencils inside did not draw his interest, as opposed to the third task in which the experimenter took out a toy car from one box and put it in another while Krzyś was gone. Daniel carefully watched the movement of the car and pointed to the box in which it was placed. After Krzyś returned, Daniel first decided to swap the boxes around, but, on second thought, he positioned them as they originally were, put the car back in the first box and handed it over to Krzyś.

Filip's performance of one of level 2 tasks

Filip correctly answered whether the pictures lying on the table between him and the experimenter were upside-down or right-side-up, but when asked about the experimenter's visual perspective gave two wrong answers, stating both times that the experimenter saw the pictures as he did. Before answering a third question about the experimenter's perspective, Filip got up from the chair, walked up to the other end of the table, and only then concluded that the picture of an elephant was upside-down.

A probable reason why both Filip and Daniel needed to perform spatial manipulations and take an active part in the presented situation to understand another's perspective (Filip walked up to stand by the experimenter and Daniel changed the location of the toy car) was that they still were unable to process the necessary transformations in their minds. Further research with a larger group of ASD children is necessary to confirm it beyond doubt.

DISCUSSION

The co-occurrence of more developed ToM ability and higher language skills in persons with ASD was brought to attention by Joseph and Tager-Flusberg already in 2004. The results of their study have been confirmed by other researchers (Fisher et al., 2005; Lombardo et al., 2016).

Reports (He et al., 2012; Rubio-Fernandez, Geurts, 2013) on children with typical development suggest that speech comprehension may be particularly important for the early stages of *theory of mind* development. The analyses showed that the importance of speech comprehension may be greater in the early stages of the acquisition of ToM skills than in the subsequent stages. It has been shown that children with ASD with typical and atypical ToM development do not differ significantly in speech comprehension.

Thus, speech understanding does not sufficiently compensate for the lack of another skill that allows children with ASD to develop belief understanding.

Some conclusions as to which ability helps children with ASD to develop their ToM skills can be drawn from the analysis of the performance of *belief understanding* subscale of *SToMM* by Filip and Daniel. Its results show that the children with ASD solve ToM tasks by changing their position or the position of objects. Filip, who was unable to align his visual perspective with that of the experimenter, went around the table to see the pictures as the experimenter saw them. Daniel decided to move objects so that their positions corresponded to what Krzyś – the doll knew.

These findings remain consistent with previous research reports on individuals with ASD (Pearson et al., 2016), according to which persons with ASD who try to solve a visual-taking task usually come up to another person to understand his/her perspective rather than making changes in the object.

Grosse Wiesmann and Southgate (2021) note that providing children whose *theory of mind* is not fully developed due to their age (under 4 years old) with the opportunity to actively participate in the situation causes them to perform well on *theory of mind* tasks. For the development of the early ToM stages in children with ASD, the ability to modify one's perspective may be as important as speech comprehension. Therefore, when planning ToM training for children with ASD, it is important to focus on developing speech understanding in the first stages of training program and to encourage participants to manipulate objects in space, move them and move themselves during the subsequent stages of training.

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ANNEX

The Theory of Mind Mechanism Scale (SToMM): Understanding beliefs subscale (Howlin et al., 1999; adapted by Krzysztofik, 2016)

Level I: Simple visual perspective-taking

Materials
Three cards with a picture on each side:
– a pen, a key,
– a dog, a tree,
–va telephone, a flower.

The experimenter shows the child a picture on one side of the card and asks: *What is it?*
The child is shown the picture on the other side and the experimenter asks again: *What is it?*
The experimenter holds the card in such a way that him/her and the child sitting opposite only see the picture on their side.
A question about the child's perspective: *What do you see?*
A question about another's perspective: *What do I see?*

Level II: Complex visual perspective-taking

Materials
Three cards with a picture on each side:
– Mickey Mouse,
– an elephant,
– an alarm clock.

The experimenter puts a card on the table/floor between him/her and the child so that one of them sees the picture upside down and the other right-side up. It is important that in some trials the child sees the picture upside-down and in others right side-up (Mickey Mouse should be placed right-side up, the elephant upside down and the clock right-side up).
A question about the child's perspective: *Is Mickey Mouse/the elephant/the alarm clock in the picture you're looking at upside down or right-side up?*
A question about another's perspective: *Is Mickey Mouse/the elephant/the alarm clock in the picture I'm looking at upside down or right-side-up?*

Level III: Understanding the "seeing leads to knowing" rule

Materials
a) different boxes,
b) the doll Krzyś,
c) similar objects of different sizes:
   – a long green pencil, a short green pencil,
d) objects of different colors:
   – a grey button, a white button,
   – a striped ball, a ball with a chime inside.

Section A. Assessment of the child's own knowledge

Materials
a) a box,
c) similar objects of different sizes:
   – a long green pencil, a short green pencil.

The experimenter says: *Let's play a hiding game with the box. Look at the pencils, please. This one's long and this one's short. I'll put one of them in the box. Will you close your eyes, so that you don't see which pencil I'm putting in?*
The experimenter places the long pencil in the box and hides the second pencil too.
A question about the child's knowledge: *Do you know which pencil is in the box?*
(No)
A request for explanation: *Why don't you know which pencil is in the box?*
(Because I didn't see... etc.).

Section B. Assesment another person's knowledge

Materials
a) a box,
b) the doll Krzyś,
d) objects of different colors:
   – a grey button, a white button.

The experimenter says: *Let's play a hiding game with the box. This is Krzyś. Krzyś can play with us. Let Krzyś see the buttons. Look Krzyś, this button is grey and this one's white. Now. Let's hide one of them in the box. Make sure that Krzyś doesn't see which button we are putting in the box. Which button shall we put in the box? Pick one, please.*
The child should be encouraged to choose one of the buttons and place it in the box. If he/she does not want to do it, the experimenter should hide the white button for the child. The other button should be hidden too.
Now Krzyś is coming back.
Let Krzyś look at the button in the box.
Krzyś is moved closer to the box so that he can look into it.
A question about the child's knowledge: *Does Krzyś know which button is in the box?*
(Yes)
A request for explanation: *Why does Krzyś know which button is in the box?*
(Because he saw...)

Additional tasks

Materials
a) two different boxes,
b) the doll Krzyś,
d) objects of different colors:
   – a striped ball, a ball with a chime inside.
The experimenter says: *Let us show Krzyś the balls. Look Krzyś, this ball is striped and this one has a chime inside. Now we are putting one of them in the box. Make sure that Krzyś doesn't see which ball we are putting in the box.*
Which ball shall we put in the box?

The child should be encouraged to pick one ball and put it in the box. If he/she does not want to do it, the experimenter should hide the striped ball for the child. The second ball should be hidden too.
Now Krzyś is coming back.
This time we will not let Krzyś look into the box.
A question about the child's knowledge: *Does Krzyś know which ball is in the box?*
(No)
A request for explanation: *Why does Krzyś not know which ball is in the box?*
(Because he didn't see...)

Level IV. Predicting another's behavior based on their mental state

Materials
– a toy house,
– the doll Kasia,
– toy furniture,
– two metal balls,
– two yellow caps,
– two toy bowls.

The experimenter says: *Let's play with Kasia and the toy house.*
Look, one of Kasia's balls is on the desk and the other is on the floor.
This morning Kasia saw the ball on the desk, but she did not notice that on the floor.
A question about belief: *Where does Kasia think the ball is?*
A request for explanation: *Why does she think the ball is on the desk?*

The experimenter says: *Let's now give Kasia the caps. Look, one of the caps is on the chair and the other is on the bed.*
This morning Kasia saw the cap on the chair but she didn't notice that on the bed.
A question about belief: *Where does Kasia think the cap is?*
A request for explanation: *Why does she think the cap is on the chair?*

The experimenter says: *And now let's give Kasia the bowls. Look, one bowl is on the table and the other one is on the desk.*
This morning Kasia saw the bowl on the table but she didn't see the one on the desk.
A question about belief: *Where does Kasia think the bowl is?*
A request for explanation: *Why does she think the bowl is on the table?*

Level V: Understanding false beliefs
Section A. An unexpected change

Materials:
– a toy house,
– two dolls (Bartek, Kasia),
– toy furniture,
– a toy water can.

The experimenter says: *Let's play some more with the toy house, Kasia, and Bartek.*
Look, Kasia is putting her water can in the armchair.

Kasia is going out to play in the playground. When Kasia is gone she can't see what Bartek is doing. Bartek is playing a trick on Kasia. He is putting the water can on the shelf.
Kasia is coming back from the playground.
A question about belief: *Where does Kasia think the water can is?*
A request for explanation: *Why does she think it is in the armchair / on the shelf?*

Section B. Unexpected contents
Materials
– a cardboard drug box,
– the doll Krzyś,
– colored pencils.
The experimenter says: *This is a drug box.*
A question about initial belief: *What do you think is inside the box?*
Let's look into it. Can you open the box?
Look, there are colored pencils inside. Let's close the box.
A question about false beliefs: *What did you think was in the box before we opened it?* (Pills)
A question about reality: *And what does it really contain?* (Colored pencils)
Look, Krzyś is coming back.
A question about another' beliefs: *Krzyś is looking at the box. What will he think the box contains?*

Section C
Materials
– the doll Krzyś;
– two boxes, one blue and one red
– a toy car.

The experimenter says: *Let's play with Krzyś again.*
Look, Krzyś has a car.
Here we have two boxes, one is red and the other is blue. Krzyś is putting his car in the blue box.
Now Krzyś is going out to play.
Krzyś is leaving the room.
Krzyś is gone. He can't see what we are doing.
Shall we play a trick on Krzyś? He can't see us. Let's remove the car from the blue box and put it in the red one.
A question about belief: *Krzyś is coming back from the playground. Where does he think the car is?*
A request for explanation: *Why does Krzyś think the car is in the blue box / red box?*