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Imaginary Perspective Taking in Six-Year-Olds

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Abstract

The study concerns imaginary perspective taking (IPT) in six-year-olds and is a replica of the studies undertaken by the Van den Heuvel-Panhuizen, Elia and Robitzsch team (2015). Imaginary perspective taking comprises two components: IPT 1 refers to perception, the so-called "visibility of objects", i.e. deducing which object is visible or not from different points of view. IPT 2 (appearance, imaginary perspective taking) refers to the ability to describe what an object looks like when viewed from different points of view. The study was aimed at defining development of the six-year-olds' ability to take a different perspective and comparing it with the results of Van den Heuvel-Panhuizen's team. 74 Polish six-year-olds participated in the study: 36 children living in the urban environment (17 girls, 19 boys) and 38 children from rural areas (15 girls and 23 boys). A set of trials of Imaginary Perspective Items IPT1 Visibility items and IPT2 Appearance items constituted the research tool. The studies have shown that Polish six-year-olds demonstrate the first level of competence in taking a different perspective and a high ability to understand that different locations mean different points of view. The vast majority (71.8%) of children correctly determine whether an object is seen or not from a different perspective. The ability to properly perceive the appearance and shape of an object is at the development stage in the examined six-year-olds (45.5% of the tasks performed correctly). The study confirmed the conclusions drawn from the reports of Van den Heuvel-Panhuizen, Elia and Robitzsch (2015) and proved that neither gender nor local environment constitute factors differentiating six-year-olds' achievements in developing the ability to take a different perspective.

Keywords: imaginary perspective, decentration, children, spatial thinking, replication studies.

Introduction

Imagination and spatial abilities are essential cognitive abilities that are important in the learning process. Studies show that it is already at the age of 3 when the ability to count objects and represent numbers plus to perform simple adding and subtracting is related to spatial abilities (Van den Heuvel-Panhuizen et al., 2015, p. 345). In addition, spatial thinking is a basic skill needed in solving everyday problems, such as finding a way, manipulating objects or imagining an object or a situation. Studies show that spatial abilities are a predictor of mathematical achievements at all levels of education and development (Clements & Battista, 1992; Sarama & Clements, 2009). Spatial intelligence is characteristic of artists, architects, geographers, surgeons or navigators. According to researchers (Gardner et al., 2001, p. 158) it develops until middle childhood, on condition that children are provided with appropriate support and education.

The subject of this study is the ability to take a different perspective. Imaginary perspective taking (IPT), also referred to as decentration and described in the context of a lack of egocentrism, is connected with the ability to see the world through the eyes of others and become independent of one's own point of view. It can also be defined as the ability to predict how objects are seen by people looking at them from a different perspective. This ability emerges already in the preschool age and is a symptom of operational thinking.

The aim of the study was to define the level of development of imaginary perspective taking (IPT) in six-year-olds attending pre-school institutions in rural and urban areas in Poland and to verify whether gender and place of residence may be significant factors differentiating achievements in this respect. The studies were focused on specifying two types of competences within this ability, identified by research teams of Masangkay (1974) and Flavell (1981), i.e. the ability to imagine whether an object is visible from a particular point of view (ITP type 1, imaginary perspective taking: visibility) and the ability to perceive how an object or a scene is visible from a particular point of view (IPT type 2 imaginary perspective taking: appearance). The need for a diagnosis was connected with obtaining an answer to the question about the level of development of these skills in children who are just about to start school education. What was also of interest was whether children with different backgrounds in terms of quality (urban/rural) demonstrate any differences in the level of development of decentration. The study also arose from the need to reflect on the importance of the ability to take an imaginary perspective for the development of a young person living in the age of dynamic industrial growth and modern

technologies and using their abilities in the future to become known in professions related to exact sciences, technology, engineering, art and mathematics (STEAM).

Terms

The ability to take another person's perspective refers to a number of abilities and skills related to intelligence, perception, imagination, thinking and specific spatial abilities. The place of decentration in models of abilities and theories of intelligence has not been precisely determined, and that is why it is worth referring to these concepts. You will find below selected definitions of the terms related to the subject and the terminology adopted for research purposes.

The literature provides numerous terms related to decentration. Starting from the broadest perspective, these include: spatial/visual-spatial intelligence, spatial imagination, spatial thinking, spatial literacy, spatial ability, imaginary perspective taking).

Spatial/visual-spatial intelligence is a concept introduced by Howard Gardner. It is defined as the capacity to perceive visual or spatial information, to transform it and recreate visual impressions, even without the physical presence of the original stimulus. The basic abilities related to this type of intelligence consist in the ability to create three-dimensional visual images and to move and rotate these representations (Gardner et al., 2001, p. 158).

According to Antoni Pardała (1995, p. 109), spatial intelligence is a vivid dynamic ability to actively construct and reconstruct images that reflect spatial forms, flat and linear realities – physical space, but also mathematical objects abstracted with the assistance of this space, or abstract spaces discovered in the course of education, as the ability to transform these images by means of appropriate mental operations.

Spatial thinking is a rather broad concept and is described as a combination of three supporting elements: spatial understanding, tools for representing reality and reasoning processes. For individuals to conceptualize space, understand representations and reason spatially, they need to possess appropriate spatial skills (Lee & Bednarz, 2012, p. 15).

Spatial ability, usually defined as spatial perception, visualization and orientation, is perceived as a narrower concept compared to spatial thinking (Lee & Bednarz, 2012, p. 15). Spatial literacy, according to Mary Jo Pollman (2010, p. 5), is a number of cognitive operations that enable problem-solving. It comprises the ability to change a point of view (imagine things seen from a different

perspective), mental rotation (understood as rotating in one's mind), analytical use of space (ability to analyze how to use space in relation to another perspective), representation ability (useful in symbolic positioning of an object or place, e.g. we symbolically represent objects and their position one in relation to another on a map) and spatial reasoning (ability to understand how objects are located in space and one in relation to another). According to Nora Newcombe and Thomas F. Shipley (2015), spatial information allows for account properties such as shapes, position, roads, relations between objects and relations between objects and reference points. With regard to spatial abilities, the classification by Newcombe and Shiplay (2015, p. 7) identifies five classes of such abilities. These include: disembedding, spatial visualization, mental rotation, spatial perception and perspective taking. In numerous studies, Newcombe (1989, 2013) provides evidence that there are two types of spatial abilities: between-object representation and transformation skills and within-object representation and transformation skills. In this regard, imaginary perspective taking is connected with the first type of abilities and mental rotation with the other one.

Imaginary perspective taking is a mental representation of a perspective different from ours and includes two components (Masangkay et al., 1974; Flavell et al., 1981; Michelon & Zacks, 2006; Van den Heuvel-Panhuizen et al., 2015). The first level of competence refers to perception, "visibility of objects", which is connected with the ability to deduce which object is visible or not from different perspectives and points of view. The second level of competence is the ability to determine what an object looks like when viewed from different perspectives.

The first level of competence (IPT type 1 imaginary perspective taking, visibility) relates to whether an object can be seen from the perspective of another observer, without considering the aspect of how it is seen. This competence means changing one's own perspective to that of the observer and the ability to draw non-egocentric conclusions with respect to that observer's perspective and visual experience. This means that the child knows that one view is possible from the position of one observer and a specific view cannot be seen from more than one position. This is the 'different positions, different points of view' type of understanding. In order to determine whether an object is visible, it is possible to use a strategy, that is to visualize oneself in a different position, direct your line of sight from that position and check whether the target meets that line. The line of sight can be an imaginary process analogous to mental scanning or visualization, as if the line was drawn between another observer and the target. For this reason, researchers (Michelon & Zacks, 2006) think that

this skill does not require changing from the egocentric to non-egocentric point of view and decentration, but only good eye tracking of an imaginary line from one object to another. As reported by Flavell (1981), 3-year-olds demonstrate achievements of the first level, but they find it difficult to achieve the second level of competence. Usually, the second level is achieved at the age of 4–5.

The second level of competence (IPT type 2 imaginary perspective taking, appearance) is higher and goes beyond the child's judgment that an object is visible or not. It refers to the appearance of objects and includes the ability to describe what an object looks like when viewed from different perspectives. This level of competence requires special knowledge of how changes in the observer-object relationship impact object perception. The described skills are also referred to as projective and perspective skills (Van den Heuvel-Panhuizen et al., 2015, p. 347). This level means that a child also needs to deal with the numerous aspects of the visual appearance of an object, taking into account its characteristics such as size, shape and location. Therefore, when we imagine how an object is seen from different perspectives, it is also necessary to take into account its characteristics. This means using specific knowledge about how changes in the observer-object relationship change the appearance of the perceived object. John H. Flavell and his team (1980) proved that 4-year-olds successfully infer that an observer who is closer to an object can see it more precisely and better than an observer who is further away. In addition, a 4-year-old understands, both from their own and another observer's perspective, that when objects are much further away they look smaller and when they are closer they appear to be bigger. Pillow and Flavell (1986) also discovered that 4-year-olds understand how an object's orientation can be modified in order to make it appear more circular or elliptical both, from their own and another observer's perspective. On the other hand, 3-year-olds are less able to imagine the shape-direction relationship.

Empirical references

Jean Piaget and Bärbel Elisabeth Inhelder (1956) conducted pioneering research on imaginary perspective taking. In their well-known "three mountains" experiment, a display is used that presents mountains that differ in size and color. The child's task is to look at the model from different viewpoints, and then view it from the researcher's perspective. In the next stage of the experiment, from among a number of photos a child selects a landscape model representing the view from their perspective. Later on, a doll is placed in different positions at

the table in relation to the displayed model. The child's task is to choose the right picture, this time showing the mountains from the doll's perspective (in another version – from the experimenter's perspective). These studies have shown that children under the age of 6 and 7 choose pictures that represent exactly the same perspective as theirs; they cannot imagine a view other than the one they see. Their own perspective becomes generalized (Gardner et al., 2001, p. 91). In the case of older children, 8–9-year-olds, this is no longer a problem; they are able to look at the world through the eyes of others, i.e. they are able to decentrate, which means to become independent from their own perspective and predict how a model or its representation in a picture or a photo is seen by the people looking at it from a different perspective. Piaget and Inhelder justified such reasoning with children's egocentrism, which consists in the inability to present the world from a point of view other than their own. A child is not able to understand that there may be points of view other than the subjective one. For example, when asked what the person sitting across the room sees, a boy will describe the appearance of objects from his own perspective (Birch & Malim, 2002, p. 22). Thus, Piaget and Inhelder (1956) concluded that, prior to entering the stage of concrete operations, a child is incapable of social decentration that requires taking someone else's perspective and coordinating it with its own. It was the lack of this ability that was used to justify children's failure to solve cognitive tasks in the developed trials.

A later study, modified by Martin Hughes (1975) and known as the "Policeman doll" study, demonstrated that younger preschoolers are, in fact, able to take and coordinate multiple social perspectives, as long as the task instruction is simplified and emotionally tinted. That is why Hughes proposed his own storyline, additionally introduced a policeman doll, and the child's task was to hide a boy doll from a policeman doll on a model consisting of two intersecting panels. In this case, the task was performed by 90% of examined children, although two points of view had to be adopted. Helen Borke (1975), who replicated Piaget's studies, demonstrated that 3–4-year-olds (N = 22) can be non-egocentric and understand the different point of view of another person. Two dolls were used in her trials, first one looked at the model first, and then the second one was introduced. The child's task was to arrange the second doll in such a way so that it could see the objects on the model in the same way as the first doll. Despite a small research sample, the positive results of the respondents brought cognitively surprising results.

Similarly, studies undertaken by Nora Newcombe (1989) showed that younger preschoolers are able to take an imaginary perspective, which was con-

cluded by Newcombe as a result of the early process of supporting their thinking and accessibility of the tasks used. Similar conclusions appeared in subsequent studies by Newcombe and Huttenlocher (1992). Their results showed that children before the age of 3 respond egocentrically, referring only to their own perspective, and after the age of 3 they are able to successfully indicate the position of objects in relation to a point of view other than their own. These studies undoubtedly prove acceleration of children's development with regard to imaginary perspective taking. This opinion is shared by a Polish psychologist Janusz Trempała. In his opinion (Trempała, 2012, p. 13), a child is born with some basic form of competence to take someone else's perspective, and this ability improves much faster than Piaget's findings suggest.

Environment and gender

An individual's living environment is an essential factor in their development. This is an indisputable fact nowadays. Although they show the relationship between development of spatial thinking and various aspects of the learning culture, such as the physical environment, language, social practices, the studies conducted so far (Berry, 1971; Montello, 1995) also emphasize that the achievements in the sphere of spatial thinking development are not too varied in different cultures. This is probably the result of the similarities in the organization of the human nervous system, the structure of the processes taking place in the body, similarities of the learning and socialization processes and people's living conditions. The differences emerging in the sphere of spatial skills and thinking are justified with the access to modern technologies and the teaching style (Van den Heuvel-Panhuizen et al., 2015, p. 348). As proved by researchers (Bishop, 1973; Huttenlocher et al., 1998; Bilewicz-Kuźnia, 2018) early educational experiences consisting of manipulation with teaching materials, e.g. blocks, positively influence the development of spatial and geometric abilities.

Apart from the family, kindergarten is an environment important for a child's development. Work in a kindergarten is regulated by the guidelines of the core curriculum (MEN, 2017) and the Recommendations of the Council of the European Union on key competences (Council of the EU, 2018). According to them, supporting the development of spatial abilities refers to the development of competences in the field of natural sciences, technology, engineering, art and mathematics. These recommendations can be implemented in various ways, since the teacher's educational autonomy refers to selected pre-school education programs, organization of work and educational space, including pro-

viding the classrooms with teaching materials and aids. These elements may be factors differentiating children's achievements in the development of spatial abilities, including the ability to take a different perspective.

Differences in children's mathematical achievements based on gender were and still are the matter of interest for the researchers, also in Poland (Oszwa, 2008; Bilewicz-Kuźnia, 2018). The relevant research results are varied. Some indicate that during childhood, boys do not differ from girls in terms of spatial skills (Lachance & Mazzocco, 2006; Bilewicz-Kuźnia, 2018), or that boys show higher achievements in this field (Moore & Johnson, 2008; Casey et al., 2008). Studies involving preschool children and regarding adoption of a different perspective have shown that in tests consisting in determining the position of a structure made of blocks from two points of view, of the researcher and the child (Liben, 1978), and in the tasks consisting in determining which of the objects will be seen in a given position through the eyes of another observer (Newcombe & Huttenlocher, 1992) no gender-based differentiation was observed.

In their original project *Building Blocks Pre-K*, American researchers Douglas Clemenst and Julie Sarama (2007, p. 158; 2009) diagnosed and described the abilities of children in the field of creating patterns and structures and proved that collecting structured experiences with geometric material results in improving their knowledge of and skills in mathematics even before starting formal school education. Organized, early educational interactions help develop the foundations of informal mathematical knowledge. This is beneficial, especially for children from neglected and culturally poor backgrounds. Early cognitive stimulation with geometric material allows to eliminate developmental deficits and deficiencies, especially in the case of pupils from neglected environments, which makes their school start less stressful.

Methods

The study is a replica of the study conducted by a team composed of Van den Heuvel-Panhuizen, Elia and Robitzsch (2015). Its aim was to determine how Polish six-year-olds deal with problematic situations that require adopting an imaginary, different perspective of the characters presented in the pictures, which are two-dimensional representations of real situations. The research tool was the same as used by Van den Heuvel-Panhuizen et al. (2015), i.e. a set of trials defined as Imaginary Perspective Items; IPT1 Visibility items and IPT2 Appearance items (Van den Heuvel-Panhuizen et al., 2015, pp. 358–361).

The research questions included the following:

1. Are Polish six-year-olds able to take an imaginary, different perspective and to what extent?

1.1. Are six-year-olds able to imagine whether an object is visible from a different perspective and to what extent (IPT1)?

1.2. Are six-year-olds able to determine the position, appearance and shape of an object imagined from the perspective of another observer and to what extent (IPT 2)?

2. Does gender and local environment differentiate children's achievements in terms of their ability to take a different perspective?

The studies were conducted in a separate kindergarten room and took the form of individual interviews with a child. A quantitative research strategy with the diagnostic survey method was adopted and the research tool – a series of images of Imaginary Perspective Items; IPT1 Visibility items and IPT2 Appearance items Van den Heuvel-Panhuizen et al. (2015). The set of trials consists of 13 tasks performed with the aid of pictures illustrating problematic situations. The set of pictures 1–7 and the tasks assigned to them allow to determine ITP type 1, i.e. the ability to imagine whether an object is seen from the perspective of another person, and the set of pictures 8–13 ITP type 2, i.e. the ability to visualize the appearance of an object seen from a different perspective. In order to collect the research material, the ITP test research tool was used with a set of tasks described in detail and illustrated by Van den Heuvel-Panhuizen, Elia and Robitzsch (2015, pp. 351–361). Sample selection was targeted and took into account the age of the children, their pre-school experience and local environment. Children who were six years old in the calendar year of the study, with at least one year of pre-school experience and coming from diverse local environments: i.e. urban and rural (from the city of Lublin and two villages located in the Lubelskie Voivodeship, Kraśnik poviat, Poland) were selected for the study. The total number of surveyed children was 74: 36 children living in the urban environment (17 girls and 19 boys) and 38 children living in villages (15 girls and 23 boys).

Results

Six-year-olds' imaginary perspective taking (IPT), which comprises two elementary abilities, i.e. the ability to visualize an object from a different perspective, here referred to as visibility (IPT1) and the ability to visualize its appearance (IPT2) develop as they grow and are associated with abstract thinking, since

they require seeing objects or their representation from a different perspective, the ability to go beyond their point of view and imagine the position of another person, their way of seeing things, their perception of space, surrounding shapes and forms. The data collected while solving tasks 1 to 13 made it possible to evaluate children's general development of the ability to take an imaginary perspective, with the possibility to distinguish levels of development of this competence, i.e. the 1st level of competence, which was diagnosed in tasks 1–7, and the 2nd level of competence, which was tested in tasks 8–13.

Table 1. Six-year-olds' (N = 74) results in imaginary perspective taking (IPT): IPT 1 (visibility), IPT 2 (appearance)

Results	Average	Min. result	Max. result	SD	Maximum number of points to be scored by a group	Number of points scored	% of the maximum number of points to be scored by a group
IPT 1 visibility	5.03	2	7	1.19	518	372	71.8
IPT 2 appearance	2.97	1	5	1.16	444	220	45.5
IPT Total	**8**	**4**	**12**	**1.76**	**962**	**592**	**61.5**

Source: Author's research.

Considering children's competences in adopting a different perspective (IPT Total), it should be concluded that the surveyed 6-year-olds correctly solved more than half (61.5%) of the tasks allowing to determine their ability to conclude whether an object is visible and how it is seen if it is mentally perceived from a different perspective. As the data presented in the table shows, the surveyed 6-year-olds are more skilled in understanding that different locations mean different points of view and they definitely determine correctly whether an object is seen or not, compared to understanding that objects change their form and appearance, when viewed from different perspectives. The surveyed 6-year-olds definitely demonstrate the first level of competence, i.e. the ability to take an imaginary perspective. They understand that an object, when viewed from a different point of view, may sometimes be visible and sometimes not. In seven different tasks diagnosing this skill, the children correctly solved more than 5 tasks on average. These tasks were aimed at evaluating whether and how an object is visible from different perspectives, e.g. from a bird's eye view (task 1. Umbrella, task 3. Street, task 5. Tower), at the level of the character's

eyesight, looking straight ahead (task 4 Basket), from downwards, from a frog's perspective (task 2. Duck, task 6. Wall), or from different distances (task 7. Hole). The surveyed six-year-olds achieved high results (71.8% of the possible score), which means that six-year-olds are very effective in changing their own perspective to the perspective of another subject and by that also able to make non-egocentric conclusions about the visibility of an object.

Tasks 8 to 13 made it possible to assess how many children are able to determine what an object looks like from a different perspective (e.g. what a mouse looks like from above, from a bird's eye view – task 8, cucumber cut in half – task 9, bird seen through a hole in the fence – task 10, football playing scheme from a bird's eye view – task 11, table from the perspective of a person sitting under it – task 12, or a tree turned around in the picture, with an animal sitting on it – task 13). The IPT 2 ability means understanding that an object takes a different shape or size from a different perspective. It is not obvious that a child understands that when something is much further away it looks smaller and when it is closer it looks bigger. The studies have shown that the average result in solving six tasks of this type was almost 3 (2.97). It can be presumed that six-year-olds understand to a large extent that objects change their form, appearance and shape when seen from a different perspective, by another person. However, this ability is still in the development phase, and children make a lot of mistakes when assessing perception of an object seen from a different perspective. Their thinking about the appearance of an object is correct in nearly half of the answers (45.5%).

Gender as a variable differentiating mathematical achievements of children also became a comparison factor in this study.

Table 2. Differences in average achievements of girls (D) and boys (CH) in individual tasks: IPT1, IPT2 and total

Task	Average D N=32	Average CH N=42	t	p
1. Umbrella	0.53	0.60	-0.54	0.588
2. Duck	0.75	0.69	0.56	0.580
3. Street	0.56	0.60	-0.28	0.781
4. Basket	0.94	0.93	0.15	0.882
5. Tower	0.94	0.93	0.15	0.882
6. Wall	0.56	0.48	0.73	0.469
7. Hole	0.81	0.76	0.52	0.606

Table 2. Differences in average achievements of girls (D) and boys (CH) in individual tasks: IPT1, IPT2 and total

Task	Average D N=32	Average CH N=42	t	p
Total IPT 1 (visibility)	**5.09**	**4.98**	**0.42**	**0.678**
8. Mouse	0.34	0.52	-1.55	0.126
9. Cucumber	0.53	0.40	1.08	0.286
10. Fence	0.88	0.88	-0.08	0.939
11. Game	0.41	0.43	-0.19	0.850
12. Table	0.38	0.43	-0.46	0.647
13. Tree	0.38	0.36	0.16	0.876
Total IPT 2 (appearance)	**2.91**	**3.02**	**-0.43**	**0.668**
Total IPT 1 and 2	**8.00**	**8.00**	**0**	**1**

df=72
Source: Author's research.

The studies have shown that gender is not a factor differentiating achievements of six-year-olds in the development of the ability to adopt a different perspective. Differences in the development of this ability between girls and boys are not statistically significant, neither in the ability to adopt a different perspective at level 1, i.e. the ability to correctly determine whether an object can be seen or not from a different perspective, nor in the level 2 abilities, i.e. being able to see that an object can be seen from different perspectives, differently, it can take a different form or shape. The analysis has revealed that girls and boys do not differ in terms of the demonstrated ability to adopt a different perspective.

Another variable that may be a factor in differentiating children's cognitive abilities is the local environment.

Table 3. Differences in average achievements of children from urban (M) and rural (W) environments in individual tasks, IPT1, IPT2 and total

Task	Average M N=36	Average W N=38	t	p
1. Umbrella	0.42	0.72	-2.71	**0.008**
2. Duck	0.76	0.67	0.91	0.364
3. Street	0.68	0.47	1.87	**0.066**
4. Basket	0.89	0.97	-1.33	0.189

Table 3. Differences in average achievements of children from urban (M) and rural (W) environments in individual tasks, IPT1, IPT2 and total

Task	Average M N=36	Average W N=38	t	p
5. Tower	0.92	0.94	-0.40	0.694
6. Wall	0.50	0.53	-0.24	0.814
7. Hole	0.71	0.86	-1.58	0.119
Total IPT 1 (visibility)	**4.89**	**5.17**	**-0.98**	**0.331**
8. Mouse	0.50	0.39	0.95	0.343
9. Cucumber	0.45	0.47	-0.21	0.833
10. Fence	0.82	0.94	-1.70	0.093
11. Game	0.55	0.28	2.46	**0.016**
12. Table	0.37	0.44	-0.66	0.512
13. Tree	0.39	0.33	0.54	0.589
Total IPT 2 (appearance)	**3.08**	**2.86**	**0.81**	**0.423**
Total IPT 1 and 2	**7.97**	**8.03**	**-0.13**	**0.896**

df=72
Source: Author's research.

The studies have shown that the local environment is not a factor differentiating achievements of six-year-olds in the development of the ability to adopt a different perspective. Differences in development of the abilities of the IPT1 and IPT2 levels between children living in urban and rural environments are statistically insignificant, as evidenced by the results of comparisons of the average of all tasks summed up. The exception are the results of two tasks, one in the visibility category and one in the appearance category, where statistically significant differences were observed. In task no. 1 Umbrella, children from the rural environment achieved higher results than the children from the urban environment. In these tasks children were asked to specify how the objects will be visible from the bird's eye view, i.e. how the umbrella and the characters standing under it are visible and what people playing football look like. The differences between the results of children from rural and urban environments were statistically significant in both tasks. In the umbrella task, children from villages scored better while in the game task involving projection, children from the city. The studies have shown that, in principle, the place of residence does not differentiate the achievements of six-year-olds with regard to the ability to adopt a different perspective, both in terms of visibility and appearance.

Discussion of results

The conducted studies have shown that six-year-olds are able to effectively adopt a different perspective and thus are able to make non-egocentric conclusions. They mostly demonstrate the first type of the ability to adopt a different perspective, i.e. the ability to imagine whether an object is visible from another perspective or not. Six-year-olds demonstrate good skills in this respect. They are less effective in determining the appearance of an object visualized from a different perspective. This ability is in the development phase. The results of the study are comparable with the results described by (Van den Heuvel-Panhuizen et al., 2015, p. 356), where the surveyed kindergartners, also including younger 4-year-olds, answered correctly from 70 to 55% of questions with regard to the ability to take a different, type 1, perspective, i.e. the ability to determine whether an object is visible from a different perspective (71.8% in this study). With regard to the 2nd level ability, i.e. the ability to determine the correct appearance of an object observed from a different perspective, the correctness indicators for the task performance in the studies conducted by Van den Heuvel-Panhuizen et al. (2015, p. 356) were 40 and 30%, in this study 45.5%. Both studies are consistent in the lower score of children in terms of the ability to adopt a different, level 2, perspective, i.e. the ability to determine the correct appearance of an object observed from a different perspective, compared to the level 1 ability, i.e. ability to determine the visibility of an object. The studies have also confirmed the conclusion resulting from previous reports (Liben, 1978; Newcombe & Huttenlocher, 1992; Montello, 1995; Moore & Johnson, 2008; Van den Heuvel-Panhuizen et al., 2015) that gender and cultural environment do not differentiate children's achievements in terms of the ability to adopt an imaginary perspective, neither in relation to the visibility of objects (IPT 1), nor in relation to their appearance (IPT 2). In terms of the tested ability, there are no differences between the achievements of girls and boys, or children living in cities and villages.

Summary

The present studies, although undertaken on a small scale, demonstrate conclusions consistent with the results of earlier, already post-Piaget studies. They allow to conclude that older preschool children demonstrate the ability to perceive the world from a point of view other than their own, which may make learning about the world more objective for them.

The surveyed 6-year-olds (N = 74) demonstrate a highly developed ability to adopt a different perspective, in particular to imagine whether an object is seen (IPT1). In terms of the ability to adopt an imaginary perspective, they have reached the first level of competence (IPT type 1 imaginary perspective taking, visibility). This means that they can change their own perspective to that of the observer and are able to draw non-egocentric conclusions with respect to that observer's perspective and visual experience. They know that one view is possible from the position of one observer and a specific view cannot be seen from more than one position. This is the 'different positions, different points of view' type of understanding. They are aware that when an object is viewed from a different perspective, it may sometimes be visible and sometimes not. This characteristic informs about a well-developed eye-directing strategy when imagining whether an object will be visible to another observer or not, i.e. a well-developed ability to correctly follow an imaginary line from one object to another.

With regard to the ability to adopt an imaginary perspective in terms of understanding the position and appearance of an object from the perspective of another observer (IPT 2 imaginary perspective taking, appearance), the study has shown that six-year-olds to a large extent (45.5%) understand that objects change their form, appearance and shape when viewed from a different perspective. However, this ability is still in the development phase.

Gender and cultural environment are not factors that differentiate children's achievements in terms of their ability to adopt an imaginary perspective, neither in terms of visibility of objects (IPT 1) nor with regard to their appearance (IPT 2). The study has not revealed any differences between the achievements of girls and boys, or children from rural and urban areas. The lack of such differences may arouse optimism and contribute to finding an answer to the question whether gender is a factor differentiating achievements in spatial reasoning and susceptibility to support already in the childhood. In order to formulate broader generalizations, it is worth extending the research. It seems important here to bear in mind that a narrow diagnosis of the development of spatial reasoning skills does not entitle us to make conclusions about development of spatial thinking in children in general, as the imaginary perspective taking ability is merely just one component of spatial thinking, especially in the light of the latest concept by Sarama and Clements (2009). For further cognitive explorations, a comparative diagnosis of the achievements of Polish preschoolers with preschoolers from other countries worldwide coming from neglected environments, children without any experiences in the field of institutional preschool care, or children educated in different educational models, may also turn out to be no less interesting.

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