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THEORY OF MIND DEFICITS IN AUTISM

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Abstract: The work addresses the issue related to a theory of mind and its deficits, which occur among children with autism. A theory of mind is the ability a child gains in the course of its development, which gives the possibility to adopt somebody's point of view, read facial expressions and emotions.
ToM deficits in autism spectrum disorders were confirmed by the results of numerous scientific research. The experiments were conducted with the use of false-belief tests. The most popular of them is the Sally-Ann task during which a child is presented with two puppets. One of them, in the absence of the other, displaces its toy. Children with autism are not able to understand that the puppet, which did not see that its friend displaced the marble, does not realize that the marble changed its location. Another test demands from a child that it deceived its enemy, due to whom the child lost its sweets. The child was able to prevent this operation physically (by locking the box with sweets), but it could not lie the enemy that the box is locked.
Deficits that occur in autism disturb social functioning. The children have problems with lying. They are not able to understand that somebody may be convinced about the fact that some other person can possess other opinions from their own. That is why manipulating other people's opinions is very difficult for them, even though they can prevent some situation physically. Due to the theory of mind disorders, children with autism also find it difficult to pretend anything. This inability greatly impedes social functioning of those people.

Key words: ASD, autism, theory of mind.

Introduction

The original cover of the book by Uta Frith: 'Autism: Explaining the Enigma' presents the painting of Georgos de la Toura, which includes four persons sitting at a table. They are playing cards. We can also see the wine standing on the table. Such a short description does not reveal the visible tragedy happening in the reproduction. Only careful observation of looks and gestures enables to reveal interactions between the people in the picture. Certain facts should be observed and conclusions drawn from what these people think, feel and what their desires are. Obviously, it is impossible to see mental states, but they can be logically and precisely assigned by making suggestions only from speculations. How do we know that we properly perceive what we see in the picture? This is due to the tool, which the mind of neurotypical adult person can utilize, called a theory of mind [1].

The main aim of the work was to determine the theory of mind deficits occurring in people with autism spectrum disorders. Specific objectives are as follows:

- Determining the stages of children's theory of mind development;
- Explaining theory of mind's functions in every person's live;
- Presenting tests, which enable to examine the theory of mind development;
- Comparing the theory of mind deficits with the specific autism symptoms.

What is a theory of mind?

The term 'theory of mind' was introduced in 1978 by Premack and Woodruff [2]. They utilized this term when examining chimpanzees' way of thinking. 'When we say that a person has a theory of mind, we understand that one attributes certain mental states to oneself and others (...). The system of conclusions of this kind looks like a theory mainly because these states cannot be directly observed and secondly that this system may be used to create expectations related to the behaviors of other organisms'.

Flavell claims that this term is used by researchers in two ways. The first one is broader and relates to the knowledge on the mind. The second meaning concerns abstract cause-explanatory systems, which provide children with the possibility to foresee and explain behaviors by relating to non-observable mental states [3].

According to S. Baron Cohen, a theory of mind is the ability to deduct on mental states such as: emotions, imaginations, desires or intentions. By understanding other people's mental states, a person has the ability to adopt somebody else's point of view, make their future behaviors meaningful and foresee them. The key element of social skills development is the ability to predict how the other person shall behave [4].

Theory of mind development in children

It is known that a child's insight into how the mind operates starts shaping very early and develops gradually.

A human being is a social species and this fact can be observed even in the early childhood. Soon after birth, an infant eagerly looks at faces, or their schematic outline as compared to normal perception stimulus. First months of life is the period when an infant develops Eye-Direction Detector, which possesses three most significant functions: eye tracking, eye direction detection and interpreting looking as seeing. It is between 9 and 14 month of age when the Shared Attention Mechanism develops. A child follows the eyes of another person or the thing the person is indicating, it starts using gestures in order to direct somebody's attention. A child starts understanding that other people do things intentionally, just as it does. It is also a moment when a child starts developing triadic representation, involving a child, an adult as well as an object or situation from their surrounding. A 9-months old human being starts realizing that other people act intentionally.

Social cognition involves realizing the differences between ourselves and others. The popular test, which helps check the sense of one's own self, consists of determining whether a child recognizes itself in the mirror. The child should have a stamp put on its forehead (so that it does not realize it) and then it ought to be allowed to look in the mirror. If it tries to get rid of the stamp, it means that it recognizes itself in the mirror. This test is passed even by eighteen-month-old kids. Younger ones, on the other hand, instead of searching for the stamp on one's forehead, touch the mirror. This ability develops gradually in the preschool age – children start recognizing themselves in the photos or video recordings.

In order for the child to understand that somebody has other views than itself, it must learn to identify other people's desires and their visual perspective [5].

The next stage in the theory of mind development takes place when children are able to perceive that other people can notice something different than they. Although a nine-month-old infant starts sharing attention, moving its eyesight in the same direction as others, it is still unable to understand that people see the same objects from a different perspective [6]. A perspective or a point of view is a place from which somebody looks at something (person/object/event), which reveals only in the context related to a specific point of view [7, 8]. It does not pertain to the extended meaning of the word 'perspective' as a mental view on reality, which is relative [9]. Adopting perspective is based on utilizing mainly cognitive processes, such as drawing conclusions or imagining. It mainly pertains to somebody's epistemic states (beliefs, perception, knowledge). It does not involve their division [10].

In 1994, Gopnik, Slaughter and Melrzof conducted experiments that help detect the time a child starts realizing that others possess a different visual perspective. The person conducting the research hid the toy at his side of the windbreaker dividing him from the child; then he asked the child to hide the toy from him. The correct result of the test was noted when the child hid the toy at its side. The 2-2.5-year-old children put the toy at the side of the researcher, so not in the way they should have. They were not aware that even though they did not see the toy, somebody else could see it. 3-year-olds carried out this task with ease and they were able to describe the object, which had different appearance when being observed from various perspectives [6, 11].

The statement that children understand the possibilities of various representations of identical reality helps believe that this ability influences the efficiency of their collaboration with peers, communication with friends or making any other social relationships. The studies show that four/five-year-olds achieve better results in false beliefs tests than the three-year-olds because their abilities, when it comes to communication, are far better. The way in which children's representations of mental states develop is a constant process, it does not proceed rapidly and is strongly linked with communication skills development. It would be unjustifiable to examine children's knowledge about the world, especially the social one, and omit the ability to communicate [12, 13].

Theory of mind and autism

People endowed with a theory of mind are able to read and differentiate their mental states and assess mental activity, which means that they know when and what they are thinking about, what their desires and objectives are. They possess the ability to determine the factors influencing their motivation, way of thinking and activities. They are also able to draw conclusions on analogical mental states of other people or foresee how other person shall react in a certain situation. The processes occurring in other people's minds appear to be unnoticeable, however, conclusions can be drawn based on mimics, attitude or behavior. Other person's activities can be predicted also on the basis of non-verbal and verbal communication or by relying on own experience in mental states or interpersonal contacts, which help predict how the third party is going to behave [14, 15].

A theory of mind is one of the leading theories, which aims to explain mechanisms and models of autistic disorders. ToM helps communicate with the society and predict other people's behaviors. People with autism spec-

trum disorders do not possess such an ability. They are not aware of their mental processes and are not able to imagine or understand what is happening in some other person's 'head'. This assumption constitutes the basis for one of the main methods used to examine the theory of mind development in children: Sally-Anne task. In order to complete it successfully, it is necessary to possess a theory of mind, which autistic children lack. The first hypothesis proposed by S.Baron- Cohen and A. Leslie (1985) assumed that the reason for the observed qualitative social contacts disorders and the lack of imagination in autistic children lies in the cognitive deficit. They claimed that the generator of autism is the irregularity in the development of the inborn model called a theory of mind. According to them, the system responsible for own mental states or for drawing analogical conclusions about other people's mental states does not, in this case, reach maturity [1].

H.Wimmer and D. Perner aimed at characterizing and systematizing the notion of a theory of mind in autism. They introduced the category of 'first-order terms' and 'second-order terms'. The first ones deal with recognizing and evaluating thoughts and feelings of other people. 'Second-order beliefs' is the ability to recognize the motifs and intentions of others [2, 16].

Second-order representation stand for the elusive mental events, which were remembered. The first-order is represented by objects' features and physical events. It is necessary that the first and second type of representation were stored in our mind independently. For children without autistic characteristics, due to the second-order representation, incompatible pieces of information become meaningful.

An excellent example is the moment when a healthy child plays by simulating telephone conversation and instead of a normal telephone it uses e.g. a banana. Its brain includes first-order representation of either a telephone and a banana. It can tell the destination of each of these things. Second-order representations allow to deduce that a situation when a person holding other subject in a way he or she uses a telephone, serves to imitate telephone conversation. For an autistic child, such a situation shall be entirely abstract [17].

Symptoms of the theory of mind disorders in children with autism

Alternative Thinking Ability is the ability of hypothetical thinking. A person is aware of the present state of affairs, is convinced about it, however, he or she has doubts – what would happen if the things were different. An example of such solutions can be a person going by train for an important meeting and considering what would have happened if he or she had missed the train. Alternative thinking ability provides the possibilities to pretend, play, have fun, joke or act. Autistic people have a serious or total deficit in this matter.

The basis for Alternative Thinking Ability in grammar are the conditionals. It may seem that the ability to apply this grammatical figure is partly conditioned by the ability to use the word 'would'. In the course of a normal development, these language competencies may occur as early as in the third year of age. Alternative Thinking Ability and ToM develop simultaneously and interdependently. It is not possible for either of them to develop independently [18].

Infants, who are diagnosed with autism at a later stage, represent a lack of or a huge deterioration in imitative behavior ability and as a result a theory of mind also cannot evolve. The reason is that at various stages of development, in order for imitative behavior ability to develop, the progression of a theory of mind is necessary and vice versa [18, 19]. An autistic person's mind is not able to produce hypothetical beliefs as one does not understand one's beliefs as beliefs as such i.e. something that may differ from the reality [20].

Tests used to examine a theory of mind

'False-beliefs' task is the most frequently used tool to examine a theory of mind. According to the researchers, it is the most proper way to assess if the child is aware of the fact that it is not the directly obvious state of affairs that prejudges somebody's behavior, but these are his beliefs/thinking about the reality.

SALLY-ANN TEST

In order to indicate a specific deficit of a theory of mind in autistic people, Baron Cohen et al. carried out an experiment using Winner and Permer procedure [19]. It aimed to prove that autistic children do not understand that their beliefs may differ from those of other individuals. Many performances for the youngest are based on the fact that one of the protagonists is surprised because he did not realize something other people knew. Even three-year-olds find pleasure in watching such scenes and it is noticeable that they are aware what will happen next. They are conscious of the fact that somebody does not know about something and does not take some information – known to them – under consideration.

H. Wimmera and J. Pernera's research method (1983) is based on such status quo in healthy children. Scientists determined that four-year-olds understand that some other person holds false beliefs and on this basis predict how he or she is going to behave. Baron-Cohen modified Wimmer an Perner's method. Two puppets are used to perform a scene ? Sally has a basket and Anne a box. Sally also has a marble, which she places into her basket and then leaves the room. While Sally is away, Anne takes the marble from the basket and puts it into the box. When Sally returns to

play with the marble, the child is asked a question: 'Where will Sally look for her marble?' An obvious answer will be 'In the basket', because Sally left it there. She was away when the marble was displaced and so she was unaware that something of this kind happened. She is supposed to look for the toy in the place she left it.

Conducting this test among autistic children was linked with numerous pitfalls. Inability to understand by children that Sally held a false belief could also be caused by intellectual or memory problems. Additionally, the children that also had to be examined were those without autism and also those with learning disabilities as well as the ones not restricted when it comes to social functioning in terms of the ability to attribute mental states to people. This task was also conducted among children with Down syndrome as well as normally developing ones but much younger. Mental age of each respondent was above three. The result was surprising as both clinically unimpaired children as well as those with Down syndrome answered correctly by indicating a basket. On the other hand, every autistic child provided wrong answer and indicated a box. They did not take into account Sally's false belief.

They were aware of the place where Sally hid the marble and so indicated where the marble is. The problem was the hidden conclusion: Sally does not know about the marble's displacement so it still thinks that it is inside the basket. Much less intellectually developed children with Down syndrome did not have problem with it [21].

It was also considered that the problem may lie in attributing mental states to wooden dolls. The assumption was wrong. Similar scene was performed by Alan Leslie and Uta Frith. Leslie hid the coin while Frith was away. This time children also could not tell where Uta will look for it when he comes back [1, 21, 22].

DECEPTIVE BOX TEST

It is important to take into account that the issues discussed earlier do not have to be connected with the necessity of mentalization and can be linked with other aspects of the research. Children with autism could not be unwilling to attribute false beliefs to somebody else. In order to ascertain in conclusions, researchers conducted another test – 'Deceptive Box Test'. The task was supposed to allow children to experience false beliefs themselves. A box from a well-known sweets company was used to this task. The children expected that the box contained sweets. They were really disappointed when it turned out that inside the box was hidden a pencil. When they were asked what any other child will expect to find in the box, the answer was: a pencil.

The children with diagnosed autism knew that they were wrong to think that the box shall contain sweets, they remembered their answer to the former question, but they did not fully understand why they had thought that the box would contain sweets. Their answer was obvious as the packaging suggested it, however, they were not aware that somebody else can make the same mistake as they [23].

DECEPTION AND SABOTAGE

In the Beate Sodian's experiment, children while playing were to compete with puppets: friendly rabbit and wolf the thief. The reward – a candy – was looked after by a child who had it in a special box. When the rabbit received a candy from the box, the child received two. The child was instructed to always help the rabbit. When the wolf received a candy, the child was deprived of a reward. The child was suggested not to help the wolf. A short training was enough in order for the child to know who is his friend and who is the enemy. They wanted a reward so they played in order to win.

Sodian decided to compare how the children performed the task in these two situations. The first one was sabotage and the second one – deception.

Sabotage: next to the box with candies there was a padlock with a key. A child was able to lock the box and prevent the candy from being stolen. In the game, a child was supposed to decide when the box should be locked and when not, depending on whether a friend or an enemy was appearing. This part was composed of a couple of trials. In half of them, a child was to resign from locking the box, as a friend was approaching. Either autistic children and properly developing ones found it easy to complete this task.

Deception: This time, a child did not have a padlock and in order not to be deceived by a thief, it should figure out some other method. In order to make it easier, the researcher suggested the child to tell lies to the wolf. The wolf asked: 'Is the box open or locked?'. Unimpaired children joyfully answered that it is locked. However, their peers with autism spectrum disorders found it difficult to deceive the enemy. Only autistic participants of the experiment were not able to manipulate wolf's mental state, although they easily used physical means.

This experiment proved that the problems with previous tests were not caused by misunderstanding the rules, but by the issues of a specific nature [1].

CONSEQUENCES OF THE THEORY OF MIND IMPROPER DEVELOPMENT IN AUTISM

The predominant part of autism symptoms is linked with improper development of a theory of mind. Baron-Cohen and Swettenham developed a list containing problems people suffering from autism spectrum disorders have to deal with due to the ToM deficits. The fact that a child with ASD has the theory of mind deficits causes that it does not detect the desires or thoughts of people in its surrounding, which leads to many obstacles. The most significant of

them is literality in understanding messages, which causes that any figurative expression becomes an absurd. A child is not able to understand the fiction, has problems with comprehending that something may be pretended. It also cannot pretend, which results in inability to understand jokes or games.

Considerable problems occur with the interpretation of emotions or mental states of other people. Autistic people, on the basis of mimics, understand only simple links between emotions and events. It hinders the relationships with other people. Individuals with Autism Spectrum Disorders very rarely use expressions connected with mental states i.e. know, think, imagine. They do not identify eyes or face as a source of information on emotions, which impedes communication. They do not know when somebody is lying, manipulating or deceiving, which makes them vulnerable to such actions. They have problems with empathy, understanding somebody's motivation or beliefs, which greatly hinders social functioning.

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