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EARLY BEHAVIORAL MARKERS OF AUTISTIC SPECTRUM DISORDERS

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***Abstract:** Early Behavioral Markers of Autistic Spectrum Disorders: The current study examines psychosocial characteristics and specific behaviors, which could be used as early behavior markers of Autistic Spectrum Disorders (ASD). 22 preschool children, diagnosed with ASD and their families are examined and their results compared to a gender- and age-matched control group. The results show that although children with ASD manage to acquire some behaviors typical for their age, they have failed to meet developmental milestones from earlier periods. This makes the acquired behaviors mechanical, nonfunctional and lacking in adaptation meaning. It is suggested that a therapeutic or educational program, designed to address problems of autistic children, should be based on the natural sequence of the milestones.*

***Key words:** Autistic Spectrum Disorders, social brain network, behavior markers, developmental delay.*

***JEL:** I 10, I 20*

INTRODUCTION

At present an Autistic Spectrum Disorder (ASD) is diagnosed at about 40 months of age. There is evidence that some of the symptoms manifest as early as 8 months. It is estimated that a valid diagnosis could be made at 18 months of age [2]. Additionally, parents of children with ASD say that they have noticed unusual behaviours and peculiarities in the development of their children long before the diagnosis, often before the second birthday. The early diagnosis means that the child could be included in therapy at an earlier stage and the risk of secondary cognitive deficits could be reduced. The main goal of early screening is entering early intervention programs. Due to brain plasticity in the first years of life, children develop more adequate social and communicative skills, resulting in less debilitating symptoms and deficits.

THEORETICAL MODEL OF "SOCIAL BRAIN" DEVELOPMENT AND DIFFERENCES IN AUTISTIC SPECTRUM DISORDERS

The early symptoms of ASD suggest that the brain systems, responsible for social learning and language acquisition do not develop normally. Some scientists believe that this reflect a more global problem in the development of the brain systems, which are responsible for complex behavior, and more specifically – for the coordination between several cortical regions [4]. Others suggest that autism affects specifically the social-communicative brain circuits, and that many other regions, regulating higher cortical functions, are relatively spared [5].

Psychosocial development requires the activation of several structures, which have been experimentally proven to participate in the processing of social and emotional information and in social behavior. In the presence of social stimuli there is activation in those regions. In cases of brain lesions there, abnormalities in the social behavior are observed. Key regions of this circuit are parts of the occipital and the temporal lobes (the fusiform gyrus and the superior temporal sulcus), the amygdala, and parts of the prefrontal cortex. Both the fusiform gyrus (specialized in facial recognition), and the superior temporal sulcus (specialized in the perception of motion of living objects, or "biological motion"), are important in the detection and processing of social information, such as facial expressions. The amygdala participates in the attribution of emotional

value to different stimuli – positive (reward) and negative (fear of punishment). If we imagine what is to happen if a child attributes the same emotional value to all stimuli around himself or if he attributes value to unusual stimuli, we might understand why children with autism do not pay attention to social stimuli. Difficulties in attributing negative emotional value to threatening stimuli (fear) explain why some children with ASD demonstrate apparent lack of awareness of danger [7]. The prefrontal cortex (and more specifically the orbitofrontal and ventromedial regions) play role in many aspects of social behaviour like inhibition of unacceptable reactions, monitoring and planning own behaviour. When we are interacting in a social situation, if we are skilled in communication, we constantly regard how the partner reacts to our behaviour and we adapt our actions and words accordingly. The ability to change our behaviour according to feedback is the key feature of the ventromedial prefrontal cortex. When this region does not function properly, the person remains unaware to the needs of others and tends to concentrate only on topics of his own interest. This unawareness of social feedback is a common feature of people with ASD [7].

Infant studies show that specific brain regions are activated during tasks for facial recognition, gaze and eye contact, joint attention, facial expressions of emotion and vocalizations [6]. All of these behaviours are observed in typically developing babies by the first birthday. During the first year typically develops the ability to interpret other's behaviour. The foundation of this ability is the perception of "biological motion", the differentiation between animate and inanimate objects and the ability to foresee other's behaviour through observation. Analysis of home videotapes of children, who eventually develop ASD, demonstrates that these children spend less time observing others, rarely turn to their names and often fail to develop early social gestures, like pointing. Imaging studies of preschool children with ASD show that the social-communicative brain circuit does not function in the way it does in typically developing children. There have been established less activation in social tasks and less activation during exposure to emotional stimuli and human faces [3]. A child with autism reacts differently to environmental stimuli from the first year of his life. He is less responsive to social stimuli and rarely initiates social interaction. This way he engages in less than expected social interactions during the day. Additionally he pays more attention to inanimate objects. The everyday experiences influence the connections in his brain – he forms more expectations of positive emotions (reward) associated with inanimate objects and related events, than the expectations, related to social events. The everyday life of an autistic child gradually becomes significantly more different than the one of a typically developing child. This leads to further reinforcing of brain activity patterns and their behaviour expression – stereotypical behaviours, fixation on objects and parts of objects, inability to interpret social information, avoiding peers. It is considered that those symptoms are not a part of the core neurological characteristics of ASD, but secondary patterns of behaviour. It is suggested that in the course of an early therapeutic program they might not even develop [2].

GOAL AND OBJECTIVES OF THE STUDY

The study aims to compare behaviours of children with ASD and typically developing children. The goal is to detect early behavioural markers of ASD in the period of early childhood – typical behaviours or failure to meet developmental milestones, and use those as screening tools in examination by paediatricians in child consultation.

METHOD

Participants: A clinical group of 22 children with a diagnosis of Autistic spectrum disorder and their parents. An age- and gender-matched control group of 22 typically developing children and their parents. The children are unequally distributed by gender – in each group 3 girls and 19 boys. The mean age is 47 months (varying from 24 to 60 months).

MATERIALS AND PROCEDURE

Autistic Disorder Interview – Revised (ADI-R) – conducted with the parents. The data from the interview are divided in three major areas, according to the diagnostic criteria in ICD-10 and DSM-V. These are 1) qualitative abnormalities in reciprocal social interaction; 2) qualitative abnormalities in communication; 3) restrictive, repetitive, and stereotyped patterns of behavior. It is also scored if the abnormalities have been present before 36 months of age [8].

The developmental level of each child is evaluated according to the battery Developmental Assessment of Young Children (DAYC). The evaluation is done by observation, experiment and parental report. Five big development areas are evaluated – Adaptive Behavior, Speech Development, Cognitive Development, Physical Development and Social-Emotional Development. For each of the areas the examiner determines a “basis” (a minimum of 3 consecutive skills marked as acquired) and a “rooftop” (more than 2 not acquired skills out of 5 consecutive items) [7], [10].

Parents also fill in Child Behavior Checklist 1.5-5 (CBCL). The results are analyzed by items in order to establish typical problem behaviours [1].

RESULTS AND DISCUSSION

All data from interviews regarding children with ASD are in clinical rates in the areas 1) qualitative abnormalities of reciprocal social interaction; and 2) qualitative abnormalities of communication. Five of the children with ASD do not demonstrate restrictive, repetitive, and stereotyped patterns of behavior beyond normal rates. The other 17 have elevated results in this area as well. All children from the clinical group exhibited some problematic behavior before age 3. All data from interviews regarding typically developing children falls into the reference score range and no abnormality is observed. In the Table 1 are given non typical behaviors which parents noticed before the 2nd birthday of their children.

Tabl. 1. Frequency of observed non typical behaviors of children with ASD before 2 years of age.

Number	Percentage	Behavior
21	95%	Has problems with motion (does not climb, does not run)
22	100%	Does not share joy
22	100%	Lack of or insufficient eye contact
17	77%	Lack of “babbling”
19	86%	Does not imitate
19	86%	Is not interested in reciprocal games
22	100%	Does not point with finger or hand.
21	95%	Does not look in the direction shown by the adult
17	77%	Does not react to his/her name
22	100%	Plays with a limited number/ type of toys
14	63%	Disturbances of the sleep/ awake rhythm
21	95%	Lack of social gestures (“well done”, “kiss”, “bye”)
19	86%	Unwillingness/ displeasure by physical contact
14	63%	Unusual and repetitive behaviors
22	100%	Avoids contact with children and/or adults

The results of the two groups on the scales of Developmental Assessment of Young Children are compared by one-way ANOVA.

Table 2. Results of one-way ANOVA for the differences on the scales of Developmental Assessment of Young Children (DAYC). F critical=4.06, df=42
The significant results are marked with an asterisk.

		Sum of Squares	df	Mean Square	F	Sig.
Adaptive Behavior	Between Groups	6875,000	1	6875,000	145,941*	,000
	Within Groups	1978,545	42	47,108		
	Total	8853,545	43			
Speech Development	Between Groups	20727,841	1	20727,841	357,530*	,000
	Within Groups	2434,955	42	57,975		
	Total	23162,795	43			
Cognitive Development	Between Groups	15319,114	1	15319,114	219,357*	,000
	Within Groups	2933,136	42	69,837		
	Total	18252,250	43			
Physical Development	Between Groups	9251,000	1	9251,000	240,029*	,000
	Within Groups	1618,727	42	38,541		
	Total	10869,727	43			
Social-Emotional Development	Between Groups	16848,205	1	16848,205	427,063*	,000
	Within Groups	1656,955	42	39,451		
	Total	18505,159	43			

On the scales of DAYC all results of children from the clinical group significantly differ from those of the control group. Moreover, the children with ASD do not reach the basis (the lower end) of the 24-35-months age norms. All children in the study are older than 24 months. The children with ASD haven't reached basic skills, included in the scales Adaptive Behavior, Speech Development, Cognitive Development, Physical Development and Social-Emotional Development. Even if some of the skills, typical for later periods, are acquired, the acquisition has been unusual.

Finally a two-tailed T-test for every item of CBCL is conducted, in order to estimate the significant differences between the two groups, so that the problem behaviors of ASD in early childhood are established. The results are presented in Attachment 1. The problem behaviors, demonstrated significantly more often by children with autism than by typically developing children, are related to speech problems; fears (from new things, certain situations/ people); untypical emotional reactions to change; lack of attachment and interest in communication; lack of interest in new activities; self injury; passive behavior and avoidance/ non-inclusion in active games; insensitivity to social norms. Parents also report of more digestive problems without a medical reason – nausea, vomiting, colic, constipation, eating problems. More often children with autism look miserable, irritable and worried, do not have fun.

CONCLUSION

In the current study it has been established that the earlier symptoms of Autistic Spectrum Disorders are related to passiveness (in social interactions, games, communication); with lack of basic skills necessary to develop communicative speech (pointing, imitation, babbling); digestive problems; disturbances in psychomotor development. According to the presented theoretical model the parents of children in the clinical group report that the stereotypical behaviors are developed at a later stage. The stereotyped games, restricted interests and fixation on objects (observed at ages 4 and 5), might be secondary symptoms, as well as the cognitive deficiency. The results of the study suggest that the early markers of ASD are associated mainly with the social and psychomotor development, often in combination with digestive problems.

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