Early Intervention in Special Education and Rehabilitation

Beograd 2016.

Early Intervention in Special Education and Rehabilitation

THEMATIC COLLECTION OF INTERNATIONAL IMPORTANCE

Belgrade, 2016

Early Intervention in Special Education and Rehabilitation
Thematic Collection of International Importance

Publisher
University of Belgrade – Faculty of Special Education and Rehabilitation
Publishing Center of the Faculty

For publisher
PhD Snežana Nikolić, Dean

Processing and printing
Planeta print, Belgrade

Cover design
Boris Petrović, MA

Technical Editor
Biljana Krasić

Circulation 150

ISBN 978-86-6203-086-3

By decision no. 3/9 from March, 8th 2008. The Teaching and Research Council of the University of Belgrade – Faculty of Special Education and Rehabilitation initiated Edition: Monographs and papers.

By decision no. 3/122 from August, 30th 2016. The Teaching and Research Council of the University of Belgrade – Faculty of Special Education and Rehabilitation has given approval for the printing of Thematic Collection "Early Intervention in Special Education and Rehabilitation".

SENSORY PROCESSING IN CHILDREN WITH DEVELOPMENTAL DISABILITIES[a]

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SUMMARY

Mutual integration of different sensory information enables interpretation of environmental stimuli. In children with developmental disability inadequate sensory processing is present in various degree. Emersion of sensory processing difficulties is dominant at earliest of age, so early detection is extremely important for rehabilitation treatment.

Aim of this research is to determine at which part of sensory processing, difficulties occur in children with developmental disabilities, and whether there is a difference in sensory processing between children with autism spectrum disorder (ASD) and in intellectually disabled children (ID).

Sample consisted of 61 examinee age four to six, both genders, divided in two groups. First group consisted of 42 examinees with ASD, and in the second group consisted of 19 ID children. Excluding criteria for forming the sample was existence of other medical or psychological diagnosis, neurological diseases and sensory damages.

Short sensory profile was used for acquiring the data necessary for screening of sensory processing difficulties (The Short Sensory Profile, Dunn, 1999).

In research results difficulties in certain aspects of sensory processing in children with ASD and in ID children are shown through percentage. In all instruments of subtest, more frequent sensory processing difficulties occur in children with ASD than in ID children. The difference in arithmetic mean between children's scores with ASD and children's scores with ID on screening of sensory processing difficulties is existent and it is statistically relevant (t=3.544, df=59, p=0.001).

Key words: sensory processing, intellectual disability, autism spectrum disorder

INTRODUCTION

Sensory processing is a complex neurobiological process in which individual using his senses, perceives information or stimulations from environment, sending the data to appropriate reception and processing center and responds to environmental stimuli (Parham & Mailloux, 2015). Sensory processing is developmental process and it is extremely important during first 10 years of child's life (Baranek et al., 2006). Children of typical population do not have problem in perceiving and processing outer stimuli,

a The article represents a result of the projects: "Creating a Protocol for the assessment of the educational potential of children with disabilities as well as criteria for the development of individual education programs" (No. 179025) and "Social participation of persons with intellectual disability" (No. 179017), whose realization is funded by the Ministry of Education, Science and Technological Development of Republic of Serbia.

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while children with mental disabilities respond to sensory experiences differently than children their age without mental difficulties. Initial detection of sensory processing reports often perceives clinical diagnosis (Ausderau et al., 2014).

Children with mental development difficulties can paradoxically react to certain sensory stimuli, being sometimes hypersensitive, sometimes hyposensitive to different information (certain sound, touch, pain, taste or smell). Sensory specifics are very prevalent in autism spectrum disorders (ASD) (Ben-Sasson et al., 2009a; Ben-Sasson et al., 2009b). Studies have proven greater sensory specifics in children with ASD than sensory specifics in intellectually disabled (ID) children (Baranek et al., 2006; Baranek et al., 2013). Difference in sensory processing in children with ASD and ID children are qualitative and they often represent a key part in making distinctions in behavior between these groups (Gal et al., 2010). During some research, it was detected using instruments, heterogeneity of sensory patterns in children with ASD (Goodman-Scott & Lambert, 2015), as in children with ID (Engel-Yeger et al., 2011), therefore it is necessary to evaluate specifics of sensory functions in children with mental disabilities and facilitate diagnostic procedure.

Most evidence that indicate difficulties in sensory processing are related to statements from parents, retrospective analysis of videos made in agreement with parents by experts and therapist reports. In literature, frequency of sensory processing disorder in children with ASD is in range from 42% to 95% depending on sensory dimension or questioned area (Baker et al., 2008; Chen et al., 2009; Leekam et al., 2007). Research show that in more than 70% of children with ASD sensory modulation disorder is described which influences on every sensory system (Tomchek & Dunn, 2007). In ID children frequency of sensory processing disorder was 38% during one research (Baranek et al., 2006).

Incorrect registration of sensory stimuli is characteristic for children with sensory processing disorder in responsible areas of brain sphere, hence they pay no attention to most of stimuli, or, in other case, overreacting to those stimuli (Biel, 2014).

Auditory and visual stimuli are "ignored" without tendency or they are significantly unregistered more than other kind of stimuli (Gladding, 2015). Children with ASD usually do not pay attention to everyday stimuli, like sound of bell or other noise and often do not "hear" when they are spoken to. Also, they have not developed the habit for unvaried continuous sound, which they cannot ignore, so they pay more attention to this kind of stimuli. Child with ASD may react with panic to the sound of vacuum cleaner, motor bike or other intensive sounds. But also, loud sound may create painful auditory stimuli in children with ASD (Lang et al., 2012).

Children with ASD may seem to visually ignore their environment. They look "through" people and avoid eye contact. Often, pay no attention to toys, but some details can draw their attention (spot on the floor) (Matsushima & Kato, 2013).

Brain has difficulty in discerning which information is relevant, and which one is not in children with sensory processing disorder (Parham & Mailloux, 2015). These persons have difficulties with localization of tactile stimulation, and for them it is difficult to determine position of their hands if they cannot see them (proprioceptive sensations) (Schneider, 2016). Children with ASD have great difficulties with motoric planning, which is manifested as inability to mimic certain body position. Even

though postural reaction in these kind of children are not developed correctly, they are often better than reaction which ID children express (Joosten & Bundy, 2010). This implies that brainstem in child with ASD is processing proprioceptive and vestibular stimulation which are necessary for postural reactions. Other aspects or dimensions of sensory processing which are not functioning correctly are causing the problem (Lang et al., 2012).

Children with ASD also have problem with registering other kind of stimuli. Scent is not registered and sense of taste is poorly developed for most of these children. Also, absence of reaction to pain or physical injuries may occur. However, some of the children are oversensitive to content of their meal, and refusing certain type of food for its texture. They can unusually react to stimuli of moderate intensity, like clear light and touching. Very strong pressure is the kind of tactile stimuli which is always causing positive reaction to children with ASD (Yasuda et al., 2016).

Child with ASD feels stimulation from muscles and joints better than with their eyes and ears. Stereotypic movements of hands and legs stimulate receptors in joints and muscles, which is causing sense of pleasure. These children either persistently ask for movement and vestibular stimulation, or completely refuse them. Desire for profuse movement in children with ASD occurs from feeling great satisfaction which that movement creates. Movements around their axis and rocking does not create vertigo or nausea in these children, which is indication that brain of these children is not responding to vestibular stimulation as it was supposed to (Watling, Deitz & White, 2001). In ID children long term movement around their axis does not create pleasant feeling and this kind of motion lasts much less than in children with ASD (Watson et al., 2011).

Behavior in children with ASD is inconsistent. Sometimes there can be a reaction to certain stimuli, and then the next day there will be no reaction to same kind of stimuli. It may seem that the child is stubborn and that it does not want to notice or react on purpose. However, because of the way that brain functions in children with ASD, child cannot perform consistently on daily basis. Often, with appropriate special treatment, child with ASD may learn motivation for registering certain sensory stimuli. Sensory integration treatment seeks to provide appropriate stimuli, to motivate the child and to process other sensory stimuli with contentment, especially visual (Gourley et al., 2013; Miller et al., 2007).

Brain capacity in children with sensory processing disorder, beside that it is missing to register certain sensory stimuli, it also fails to modulate them, especially vestibular and tactile stimuli (Owen et al., 2013). Large number of children with sensory processing disorder refuses movement and they are gravity unstable, because they cannot modulate sensory stimuli from vestibular center (Watson et al., 2011). Some children with sensory processing disorder get upset if someone tries to flip them upside down, to raise them high or to put them in unusual position, which indicates that relation to gravity and space is damaged (Wickremasinghe et al., 2013). However, that kind of gravitational insecurity is indicator for therapist that the child is registering certain kind of stimuli, which can provide better treatment.

Since children with sensory processing disorder are inefficiently observing stimuli from environment, information from skin, muscle and vestibular center, they cannot

develop clear perception of their bodies. So, the focus in child's treatment should be the body.

Different sensory information that brainstem receives travels to thalamus, and then to cerebral cortex which is enabling more complex aspects of interpretation of these information. Vestibular stimuli, along with proprioceptive and other sensory stimuli are being processed in higher cognitive centers and they are enabling positioning of one's body in space after which motor region exercise muscle movements (Owen et al., 2013). Disorder in this area makes child activities more difficult. Child will have a problem to simultaneously manipulate larger number of objects and sorting those objects in space. Adequate reception of visual information could not be possible without vestibular system, and it is known that this system is developed in line with hearing, with whom it "shares space" in inner ear and it's sending impulses through unique nerve to brainstem (Adams et al., 2015).

None of brain function cannot perform well if the brain does not receive or process the sensory experiences of the vestibular system. If child has vestibular system disorder, disorganization of sensorimotor system will occur (Bayat, 2015).

When a child has reduced sensory processing within the vestibular system, learning disabilities can manifest themselves through the difficulties of monitoring objects in front of the eyes, shifting gaze from one point to another, etc. There may be problems which are affecting process of drawing and scribbling (Glennon et al., 2012). These difficulties are manifested also when starting and doing physical and manual activities (Goodman-Scott & Lambert, 2015), so, it may be manifested, for example, as difficulty while playing with ball or other play activities.

People handle visual information at two levels. At the level of the brainstem vestibular stimuli, proprioceptive stimuli from the eyes, neck and body and visual stimuli are united in a complex sensory process. Based on that, "map" is created (basic rough complex), which is used for the successful guidance of the body through space. Feelings integrated in the brain stem travel to cerebral hemispheres, were next, more complex level of processing is focused more on details. Hemispheres are responsible for intentional view direction. For normal functioning constant communication and cooperation is necessary between these two systems (Wickremasinghe et al., 2013).

Inadequate communication between visual, vestibular, proprioceptive and tactile system may result in poor visual discrimination (Schneider, 2016).

Auditory processing is done on two levels, as well as visual. At the level of the brainstem auditory stimuli are associated with vestibular, proprioceptive, tactile sensations and vibrations. This level forms the basis of more complex functioning of auditory processing, which, like speech and language, is resting on the processes in cerebral hemispheres (Leekam et al., 2007; Lin et al., 2012).

Adequately developed language and speech imply good sensorimotor basis on a lower level of processing and harmonious functioning of all parts of the brain, as well as their good cooperation (Watson et al., 2011).

The purpose of the therapy in children with ASD and ID children is to improve sensory processing, in order for stimuli to be more efficiently registered and modulated with proper organization of sensory dimension treatment including motivation and incentives.

Aim of this study is to determine in which the dimension / field of sensory processing most common problem is occurring in children with developmental difficulties, and whether there is a difference in sensory processing in children with ASD and ID children in certain sensory areas.

METHOD

Sample

Sample consisted from 61 examinees age four to six (AS=5.46; SD=0.78), both genders, divided in two groups. First group consisted of 42 examinees diagnosed with ASD (68.9% of the sample), while other group consisted of 19 ID children (31.1% of the sample). In the sample, presence of boys is significantly more prevalent (46 examinees or 75.4%) than girls (15 examinees of 24.6%). Disproportion in number of boys and girls in this study is noticeable, which can be explained by the prevalence of boys with clinical picture of ASD. Excluding criteria while forming the sample referred to the existence of other medical or psychiatric diagnosis, neurological diseases and sensory impairments.

Tables 1, 2 and 3 are showing that presence of six-year-old is dominant in both questioned groups. In all institutions in Belgrade for preschool children in which data is acquired, the most numerous are six-year-old, while younger children are in lesser number.

Table 1 *Distribution of examinees in relation to age*

4 years	5 years	6 years
11 (18%)	11 (18%)	39 (63.9%)

Table 2 *Distribution of examinees with ASD in relation to age (AS=5.48; SD=0.74)*

4 years	5 years	6 years
6 (14.3%)	10 (23.8%)	26 (61.9%)

Table 3 *Distribution of ID examinees in relation to age (AS=5.42; SD=0.90)*

4 years	5 years	6 years
5 (26.3%)	1 (5.3%)	13 (68.4%)

Instrument and procedure

In collecting the data for screening sensory processing difficulties Short sensory profile is used (The Short Sensory Profile, Dunn, 1999).

This thirty-eight item instrument is designed for children ages 3 to 10. Scoring system uses five-degree Likert scale (1-5). Points are assigned according to the frequency of a behavior, ranging from 1 for “never” to 5 for “always”. This instrument performs screening of difficulties through area or dimensions of sensory processing, forming seven subscales: Tactile sensitivity, Taste and smell sensitivity, Sensitivity to movement, Under responsive sensations, Auditory filtering, Weakness of body and energy and Visual and auditory sensitivity. In detecting sensory processing difficulties, it is possible to use each subscale separately, but the author of the instrument is

advising that total score should be used, because it is the most sensitive indicator of sensory dysfunction. While filling out this instrument, apart demonstrating certain stimulus in a child, special education teacher who is spending time daily with the child is consulted, and written parental statements have been used about the presence or absence of certain sensory sensation. All parents gave their written consent to the child's participation in this study. Regarding recommended standard, it is possible to distinguish three groups of reactions (indicators) related to sensory processing: a group of typical performance (without difficulty), group with possible difficulties and group with definitely perceived sensory processing difficulties.

Research was conducted in a sample of kindergarten children who attend regular or developmental kindergarten groups, as well as in pre-school groups in elementary schools that are educating students who have problem in mental development. All institutions are on Belgrade city territory. Research was conducted continuously, without pause, in autumn/winter of 2015/2016.

Data processing

During statistical analysis following statistical procedures were applied:

- Standard descriptive statistical parameters: the arithmetic mean, standard deviation, frequency and percentages;
- For categorical data independent T-test was used to test the statistical significance of differences between groups.

RESULTS

Table 4 presents percentage scores in every subscale of instrument Short sensory profile. It can be noted that 81% of examinees with ASD are expressing very perceived sensory processing difficulties in the field of tactile sensitivity, while in half of that percentage of ID examinees a definite problem in specified dimension of sensory processing is detected. Results indicate that the remainder of examinees with ASD are also showing a tendency towards possible problems in the field of tactile sensitivity, and that neither one examinee with ASD was detected, that is expressing none of difficulties in this dimension. Possible problems in sensory processing in tactile sphere is registered in 47% of ID children, while two examinees registered no problem in processing these kind of stimuli.

Results on subscale, Sensitivity of taste and smell, indicate that in both groups of examinees definite problem is detected in processing these sensations in a very similar percentage (at about three quarters of the examinees). Seven examinees with ASD are indicating possible problems in sensory processing of taste and olfactory stimuli, while almost a third of ID examinees had no problem in processing these kind sensations.

Half of examinees with ASD demonstrate a definite sensitivity to movement, while quarter of them exhibit behavior that can be interpreted as potential issues. A quarter of the same group does not manifest difficulties while changing body position. Slightly more than half of ID examinees are expressing definite problem while changing body

position, while 42.1% of examinees have a certain degree of sensitivity to movement which is typical for regular population.

Tendency to certain identification of under responsive sensations is recorded on 95.2% of examinees with ASD and 89.5% of ID examinees. In neither group examinee which did not exhibit at least some under responsive sensation was not detected.

Auditory filtering is a subscale in which highest percentage of registration deficit is recorded, as 95.2% of children with ASD exhibit a definite problem in this part of sensory processing, while 84.2% of ID examinees from the sample shows this level of problem.

Weakness of the body and lack of energy exhibit half of children with ASD, and ID children are expressing same problems in more than half of examinees. More than third of ID children are indicating possible problems in weakness of the body and the lack of energy, while nearly a quarter of examinees with ASD do not exhibit any weakness in body construction.

All examinees with ASD are expressing a definite (81%), or potential problem in field of visual and auditory sensitivity, while in 63.2% of ID examinees a definite problem in this area is detected. However, 10.5% ID examinees show no difficulty in processing visual or auditory stimuli.

Total score, as the most sensitive indicator of sensory dysfunction, shows that in 75.2% of examinees with ASD and 62.4% of ID examinees problems in sensory processing is definitely identified. Possible problem with these abilities have been noted in 16.7% of examinees with ASD and in 23.3% of ID examinees, while 14.3% of ID children and 8.1% of examinees with ASD processes sensory data as well as typical population.

Table 4 *Percentile score on Short sensory profile subscales*

	Typical performance n (%)	Possible problems n (%)	Definite problems n (%)
ASD	none	8 (19.0)	34 (81.0)
TS ID	2 (10.5)	9 (47.4)	8 (42.1)
ASD	4 (9.5)	7 (16.7)	31 (73.8)
TSS ID	6 (31.6)	None	13 (68.4)
ASD	10 (23.8)	11 (26.2)	21 (50.0)
SM ID	8 (42.1)	5 (26.3)	6 (31.6)
ASD	None	2 (4.8)	40 (95.2)
URS ID	None	2 (10.5)	17 (89.5)
ASD	None	2 (4.8)	40 (95.2)
AF ID	None	3 (15.7)	16 (84.2)
ASD	10 (23.8)	11 (26.2)	21 (50.0)
WBE ID	1 (5.3)	7 (36.8)	11 (57.9)
ASD	none	8 (19.0)	34 (81.0)
VAS ID	2 (10.5)	5 (26.3)	12 (63.2)
ASD	3 (8.1)	7 (16.7)	32 (75.2)
TOTAL ID	3 (14.3)	4 (23.3)	12 (62.4)

Legend: Tactile sensitivity (TS), Taste and smell sensitivity (TSS), Sensitivity to movement (SM), Under responsive sensation (URS), Auditory filtering (AF), Weakness of body and energy (WBE) and Visual and auditory sensitivity (VAS), autism spectrum disorder (ASD), intellectual disability (ID)

Difference of 1.63 points between average scores of examinees with ASD and ID examinees on subscale Tactile sensitivity is at significance level of 0.01 and it is shown in

Table 5. Based on results it can be concluded that subjects with ASD exhibit significantly greater difficulties in processing tactile sensation than it is the case with ID examinees.

Table 5 *Comparison of average scores in examinees with ASD and ID examinees on Tactile sensitivity subscale*

TS	N	Mean	SD	Std. Error mean
ID	19	3.84	2.58	2.59
ASD	42	5.47	2.09	0.32

Legend: Tactile sensitivity (TS) t=2.617, df=59, **p=0.011**

Average score of two groups on sensitivity of taste and smell subscale are shown in Table 6. Difference between average scores of examinees in this subtest is not statistically significant, although slightly higher score is detected in examinees with ASD who are indicating pronounced difficulties in processing taste and olfactory stimuli.

Table 6 *Comparison of average scores in examinees with ASD and ID examinees on Taste and smell sensitivity subscale*

TSS	N	Mean	SD	Std. Error mean
ID	19	4.05	3.15	0.72
ASD	42	4.78	2.66	0.41

Legend: Taste and smell sensitivity (TSS) t=0.939, df=59, p=0.351

Results obtained in Table 7 show that difference between average scores of examinees with ASD and ID examinees on subtest Sensitivity to movement is not statistically significant. Even though a difference of 0.49 points is registered, it is not at the required level of statistical significance. Thus, both groups of examinees in this sample exhibit same problems when changing body position.

Table 7 *Comparison of average scores in examinees with ASD and ID examinees on Sensitivity to movement subscale*

OP	N	Mean	SD	Std. Error mean
IO	19	1.89	2.10	0.48
ASP	42	2.38	1.91	0.29

Legend: Sensitivity to movement (SM) t=0.891, df=59, p=0.379

Data analysis found, while screening under responsive sensation, that there was no significant difference in scores between examinees with ASD and ID examinees. Need and tendency under responsive sensations equally exhibit both groups. This minimal difference in scores is presented in Table 8.

Table 8 *Comparison of average scores in examinees with ASD and ID examinees on Under responsivesensation subscale*

PS	N	Mean	SD	Std. Error mean
ID	19	7.10	2.88	0.66
ASD	42	8.09	3.22	0.49

Legend: under responsive sensation (URS) t=1.147, df=59, p=0.256

According to results presented in Table 9 it is concluded that children with ASD are manifesting significantly more difficulties in auditory filtering than it was the case with ID children. Difference in these scores is at required level of statistical significance.

Table 9 *Comparison of average scores in examinees with ASD and ID examinees on Auditory filtering subscale*

AF	N	Mean	SD	Std. Error mean
ID	19	6.05	2.39	0.54
ASD	42	7.69	2.54	0.39

Legend: Auditory filtering (AF) t=2.372, df=59, **p=0.021**

Table 10 provides an overview in average achievement of ID examinees and examinees with ASD within Weakness of body and energy subscale. Average score of ID children on this subscale is 4.26 points, and score of children with ASD in the same part of screening instrument was 3.54 points on average. It is noted that there is no statistically significant difference in scores of these two groups, although ID children show a greater degree of weakness of body and energy.

Table 10 *Comparison of average scores in examinees with ASD and ID examinees on Weakness of body and energy subscale*

WBE	N	Mean	SD	Std. Error mean
ID	19	4.26	3.66	0.84
ASD	42	3.54	3.37	0.52

Legend: Weakness of body and energy (WBE) t=0.747, df=59, p=0.458

Reviewing Table 11 it was found that children with ASD showed significant difficulties in processing visual and auditory sensations compared to ID children, were statistically significant difference in significance level is found 0.011 (t=2.615). Reliability of such a conclusion is 99%.

Table 11 *Comparison of average scores in examinees with ASD and ID examinees on Visual and auditory sensitivity subscale*

VAS	N	Mean	SD	Std. Error mean
ID	19	3.26	2.18	0.50
ASD	42	4.85	2.21	0.34

Legend: Visual and auditory sensitivity (VAS) t=2.615, df=59, **p=0.011**

Finally, Table 12 present a total score of examinees with ASD and ID examinees on sensory processing difficulty screening instrument. Examinees with ASD achieved on average 0.32 points more than ID examinees in all areas of the Short sensory profile. This difference is on statistically significance level of 0.001. We conclude that examinees with ASD show significantly more difficulties while processing sensory stimuli compared to ID examinees.

Table 12 *Comparison of average scores in examinees with ASD and ID examinees in Short sensory profile*

SSP	N	Mean	SD	Std. Error mean
ID	19	2.63	0.49	0.11
ASD	42	2.95	0.21	0.03

Legend: Short sensory profile (SSP) t=3.544, df=59, **p=0.001**

DISCUSSION

Results of this study suggest that children with ASD in 95.2% of cases exhibit under responsive sensations which are manifesting in enjoying strange sounds, insisting on movements that interfere with work in a kindergarten, in touching people or objects for tactile satisfaction and similar. Also, 95.2% of children with ASD are indicating definite problems in auditory filtering sphere and in this area highest percentage of registration deficit is recorded. In areas of tactile, visual and auditory sensitivity strong deficits are also detected, as 81% of children with ASD are demonstrating confirmed problems in processing of such stimuli.

In group of ID children 84.2% of them are expressing problem in auditory filtering which is manifested as problem in functioning if there is much noise in the environment, there are difficulties in sustaining attention, lack of reaction when invoking the name. In group of ID children89.5% of them in this sample are expressing the need for under responsive sensations.

Foreign research in which the same instrument is applied in population of children with ASD and ID children, are showing similar percentiles like this research, especially in field of under responsive sensations and auditory filtering (Baranek et al., 2006; Baranek et al., 2013; Tomchek & Dunn, 2007).

Comparing average scores on each of subscales for both groups of children following conclusions is reached: examinees with ASD exhibit significantly greater difficulty in processing tactile sensation than it is the case ID examinees, children with ASD have shown significantly greater difficulty in auditory filtering than ID children and children in with ASD significant difficulties the processing of visual and auditory sensations are detected comparing ID children.

Looking at the total score on the applied profile, given, that it is the most sensitive indicator of sensory dysfunction, it was found that examinees with ASD in general, show significantly more difficulties in processing sensory stimuli (75.2%) compared to ID examinees (62.4%).

And this result has reached the confirmation in previous studies with similar goals (Adams et al., 2015; Ausderau et al., 2014; Ben-Sasson et al., 2009b; Engel-Yeger et al., 2011).

Many researchers in this field criticize preschool system because it is expected from children to sit still in kindergarten and thus be deprived of vestibular, proprioceptive and tactile stimulation (Goodman-Scott & Lambert, 2015). Only mutual integration of different sensory information enables interpretation of stimuli from the environment. This is especially important for children with ASD and ID children. For example, there is one type of visual stimuli that attracts attention of majority of children with ASP. These are so called "moving stripes". In front of the eyes of a child white and colored stripes are shown which are triggering "optokinetic nystagmus" (movement of the eyes caused by visual stimulant), which in turn stimulates vestibular nuclei. It is believed that stimulation of vestibular nuclei is helping the brain to register visual stimulant and make his meaningful for the child (Gourley et al., 2013).

Development of proprioceptive system has enabled for it to take over certain functions of vestibular system, which creates more efficient vestibular stimuli. A lot of

muscle contraction and joint work enables more efficient sensory input which inhibits excessive vestibular activity (Lang et al., 2012). Therefore, for children with sensory processing disorder it is significant to perform activities such as pushing, pulling, lifting and carrying heavy objects and similar. Besides impulses that are sent in this manner along the spinal cord, muscles and joints are simultaneously sending proprioceptive information up to the vestibular nuclei and cerebellum, while cooperation between multiple centers is allowed, as well as consistent and accurate body movement (Miller et al., 2007). If integration of this information is not consistent, the child will often stumble and or it will be clumsy and likely to avoid physical activity (Parham & Mailloux, 2015). Without play, child will not get enough sensory stimuli which will affect its development of nervous system as a whole. Vision, hearing and speech can naturally look neglected in sensory integration therapy because they are considered as a final product of basic mechanisms. Acting on these basic processes, especially in the vestibular, proprioceptive and tactile functioning, with special treatment it is possible to create a good basis for the development of sight, hearing and speech (Walbam, 2014).

Main limitation of this study relates to including a convenient sample of which is bound to only one region in Serbia. Numerous sample with the same or similar objectives of the research could offer clear differences in sensory responses of different clinical pictures in the context of mental development difficulties. Studies with numerous sample have greater statistical power in answering to relevant questions of sensory processing. Furthermore, conclusions regarding sensory processing have not been obtained in direct longitudinal observation, but in a shorter observation of the child through a statement of special education teachers and parents. In later studies it is possible to define models of sensory processing in children with developmental difficulties.

INSTEAD OF CONCLUSION

As already mentioned, differences in sensory modulations in children with developmental difficulties are well supported in the literature, and findings of this study are joint to available evidence. Sensory processing skills play a significant role in variability of developmental performance in children with developmental difficulties. Recognizing contribution of sensory processing as a component of development in children with ASDP and ID children can significantly direct intervention plan in preschool.

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