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Sensory integration of the tactile sensory system of children with developmental disabilities

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Abstract. Sensory integration is the organization of the senses for their use. It is a neuro-biological activity that allows the reception and processing of sensory information, which in large quantities from the senses come to the brain, at all times. The aim of the study is to examine the prevalence of sensory integration difficulties of the tactile sensory system of children with developmental disabilities, and to establish the statistical significance of differences in relation to the type of difficulty. The total sample of respondents (N=60) consisted of four subsamples of 15 respondents, namely; children with autism, children with Down syndrome, children with hearing impairment and children with sight impairment. The Mann-Whitney U test and the Wilcoxon W test at the level of statistical significance of $p<0.05$ were used to test the statistical significance of the differences between the subsamples of the subjects. The results of the study show that 86.67% of children with autism, 66.67% of children with Down syndrome, 20% of children with hearing impairment and 40% of children with sight impairment have difficulties with sensory integration of the tactile system. Children with hearing impairment (Rank M 43.97), children with sight impairment (Rank M 35.03), children with Down syndrome, and children with autism (Rank M 14.93) show the least difficulty in sensory integration of the tactile sensory system. There is a statistically significant difference in the difficulties of sensory integration of the tactile sensory system between children with autism, children with Down syndrome, children with hearing impairment and children with sight impairment at the level of statistical significance of $p<0.05$.

Keywords. sensory integration, tactile sensory system, children with disabilities, autism, Down syndrome, hearing impairment, sight impairment

1. Introduction

Sensory integration represents the organization of the senses for their use (Ayers, 2002). It is a neuro-biological activity that enables the reception and processing of sensory information, which in large quantities arrive from the senses to the brain, at any time (Biel and Peske, 2007). Sensory disintegration is an abnormality or disturbance in brain function that makes it difficult to integrate sensory stimulus input (Ayers, 2002). Difficulties in sensory integration occur when

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the brain and nervous system have difficulties in receiving and processing sensory information or if they are not exposed to appropriate stimuli (Zglavnik, 2005).

The tactile system is the largest sensory system and develops first, still during intrauterine development. Tactile information is obtained through receptors (Kranowitz, 2018), located on the skin, but also on the throat, ear canals, digestive tract... (Biel and Peske, 2007). It has the most tactile receptors in the mouth and hands (Brack Clark, 2009). The first role of touch in a child's life is to establish a connection between the mother and the infant, and this connection is important for the further development of the child's brain (Bošnjaković, 2017). The ability of the brain to successfully process tactile information allows the child to feel safe and to develop a connection with those around it (Chu, 2013).

Studies shows that most children with autism have sensory difficulties, while hearing, sight and touch are usually the most affected (Biel and Peske, 2007). An autistic child is not able to register many stimuli from his environment, insufficient or poor sensory processing can contribute to the image of autism (Mamić, Fulgosi Masnjak and Pintarić Mlinar, 2010). Children with disabilities from the autistic spectrum have specific difficulties in the perception of touch, they do not like to be petted or worn (Novaković and Pejović-Milovančević, 2019). A child may be overly sensitive to the composition of clothing, objects and food (Marković, 2017).

Children with Down syndrome may have difficulties in sensory integration. Decreased awareness and attention to tactile stimulation is possible, which leads to a reduction in tactile discrimination and more difficult manipulation of objects. Also, children can react more strongly to sensory stimuli in the form of tactile defense. As a consequence of proprioceptive hyperactivity, they avoid carrying loads on their arms, hands, feet and knees (Švraka, Avdić, Hasanbegović-Anić, 2012). There are also difficulties in processing sensations in the mouth or hypersensitivity to touch around the face. Due to the reduced muscle tone, it is difficult to suck and swallow. Children with Down syndrome very often avoid and resist when bathing, cutting and combing (Vuković et al. 2014).

Sight impairment affects the overall development of the child. Touch and other skin sensations are an important piece of information about the outside world. As a landmark, a child with sight impairment uses different textures of materials, which help him to know where he is at all times with the help of tactile perception (Šupe, 2009). Limitations arise in terms of interpretation and integration of sensory stimuli, localization of tactile stimuli, emotional attachment, self-confidence, communication, fine and gross motor skills... (Alimović, 2003). A blind child is introduced to objects and their characteristics through tactile perception (Matok, 2013).

Hearing impairment in early childhood has consequences for the child's cognitive, emotional and social development (Salkić, Hasanbegović and Švraka, 2018). Hearing loss can lead to unusual integration of sensory information. Children with hearing impairment may show difficulty in sensory processing. Anxiety may occur during personal hygiene. Children with hearing impairment may respond hypersensitively or hyposensitively to touch (Bharadwaj, Daniel, & Matzke, 2009). Children with hearing impairment have different types of behavior such as hyperactivity, aggression, difficulty communicating and social interaction with other children, seeking attention from adults... (Bradarić-Šlujo S., 1991).

The aim of the study *is to examine the prevalence of sensory integration difficulties of the tactile sensory system of children with developmental disabilities, and to establish the statistical significance of differences in relation to the type of disability.*

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2. Study Methods

2.1. Sample

The study was done on a sample of 60 respondents. The total sample of respondents was divided into 4 subsamples. The first subsample of respondents (N=15) consisted of children with autism, the second children with Down syndrome (N=15), the third children with hearing impairment (N=15) and the fourth children with sight impairment (N=15).

2.2. Type of study and assessment instrument

The study is prospective, analytical-descriptive and controlled. Data were collected using the "*Tactile Sensory Sensitivity Test Questionnaire*" (Biel and Peske 2010). The assessment instrument consists of 11 questions, variables with offered answers of possible sensory response; *neutral, avoids, seeks and mixed*. Data were collected by observing students and interviewing rehabilitators, teachers and parents of students.

2.3. Statistical data processing

Statistical analysis of the data was done in the SPSS software version 24.0. The method of descriptive statistics was used. The ranks of the matrices and the sum of the ranks of the representation of the differences in the difficulties of sensory integration of the tactile sensory system between children with developmental disabilities were made. The Mann-Whitney U test and the Wilcoxon W test at the level of statistical significance of $p<0.05$ were used to examine the statistical significance of the differences between the subsamples of the subjects.

3. Results and discussion

3.1. Frequencies and percentages of respondents' responses by variables

Hypersensitive reaction to this type of sensory input has 6.67% of children with Down syndrome and children with sight impairment. Hyposensitive type of tactile sensory response has 13.33% of children with autism, 33.33% of children with Down syndrome, 26.67% of children with hearing impairment and 20% of children with sight impairment. A mixed type of tactile sensory response has 46.67% of children with autism, 40.00% of children with Down syndrome and 20% of children with sight impairment. Normal sensory response has 13.33% of children with autism, 20% of children with Down syndrome, 73.33% of children with hearing impairment and 53.33% of children with sight impairment.

Table 1. Frequencies and percentages of respondents' responses for the variable "Touching certain parts of the body, hugs and caresses"

Groups of respondents	Avoids		Seeks		Mixed		Neutral		Total	
	N	%	N	%	N	%	N	%	N	%
Autism	0	0.00	6	40.00	7	46.67	2	13.33	15	100
Down syndrome	1	6.67	5	33.33	6	40.00	3	20.00	15	100
Hearing impairment	0	0.00	4	26.67	0	0.00	11	73.33	15	100
Sight impairment	1	6.67	3	20.00	3	20.00	8	53.33	15	100

Hypersensitive reaction to this type of sensory input has 13.33% of children with autism, 20% of children with Down syndrome and 13.33% of children with sight impairment. Hyposensitive type of tactile sensory response has 20% of children with autism. Other subjects do not have this type of tactile sensory response. Mixed type of tactile sensory response has

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40% of children with autism, 33.33% of children with Down syndrome, 6.67% of children with hearing impairment and 13.33% of children with sight impairment. Normal sensory response has 26.67% of children with autism, 46.67% of children with Down syndrome, 33.33% of children with hearing impairment and 73.33% of children with sight impairment.

Table 2. Frequencies and percentages of respondents' responses for the variable "Certain types of fabric, seams, labels, belts, cuffs, etc."

Groups of respondents	Avoids		Seeks		Mixed		Neutral		Total	
	N	%	N	%	N	%	N	%	N	%
Autism	2	13.33	3	20.00	6	40.00	4	26.67	15	100
Down syndrome	3	20.00	0	0.00	5	33.33	7	46.67	15	100
Hearing impairment	0	0.00	0	0.00	1	6.67	14	93.33	15	100
Sight impairment	2	13.33	0	0.00	2	13.33	11	73.33	15	100

A hypersensitive reaction to this type of sensory input has 20% of children with autism, 26.67% of children with Down syndrome, 6.67% of children with hearing impairment and 13.33% of children with sight impairment. Hyposensitive type of tactile sensory response has 13.33% of children with autism. Other subjects do not have this type of tactile sensory response. Mixed type of tactile sensory response has 20% of children with autism, 33.33% of children with Down syndrome, 6.67% of children with hearing impairment and 13.33% of children with sight impairment. Normal sensory response has 46.67% of children with autism, 40% of children with Down syndrome, 86.67% of children with hearing impairment and 73.33% of children with sight impairment.

Table 3. Frequencies and percentages of respondents' responses for the variable "Clothing, footwear or ornaments that are very narrow or very loose"

Groups of respondents	Avoids		Seeks		Mixed		Neutral		Total	
	N	%	N	%	N	%	N	%	N	%
Autism	3	20.00	2	13.33	3	20.00	7	46.67	15	100
Down syndrome	4	26.67	0	0.00	5	33.33	6	40.00	15	100
Hearing impairment	1	6.67	0	0.00	1	6.67	13	86.67	15	100
Sight impairment	2	13.33	0	0.00	2	13.33	11	73.33	15	100

Hypersensitive reaction to this type of sensory input has 26.67% of children with autism, 33.33% of children with Down syndrome and 6.67% of children with sight impairment. Children with hearing impairment do not show a hypersensitive reaction to this type of tactile stimulus. Hyposensitive type of tactile sensory response has 20% of children with autism and 13.33% of children with hearing impairment. Other subjects do not have this type of tactile sensory response. A mixed type of tactile sensory response has 46.67% of children with autism, 26.67% of children with Down syndrome and 26.67% of children with sight impairment. Normal sensory response has 6.67% of children with autism, 40% of children with Down syndrome, 86.67% of children with hearing impairment and 66.67% of children with sight impairment.

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Table 4. Frequencies and percentages of respondents' responses for the variable "Contamination of hands, face or other parts of the body with paint, glue, sand, food, lotion"

Groups of respondents	Avoids		Seeks		Mixed		Neutral		Total	
	N	%	N	%	N	%	N	%	N	%
Autism	4	26.67	3	20.00	7	46.67	1	6.67	15	100
Down syndrome	5	33.33	0	0.00	4	26.67	6	40.00	15	100
Hearing impairment	0	0.00	2	13.33	0	0.00	13	86.67	15	100
Sight impairment	1	6.67	0	0.00	4	26.67	10	66.67	15	100

A hypersensitive reaction to this type of sensory input has 26.67% of children with autism and children with Down syndrome, as well as 6.67% of children with hearing impairment and children with sight impairment. Hyposensitive type of tactile sensory response has 13.33% of children with autism, 20% of children with hearing impairment and 6.67% of children with sight impairment. Children with Down syndrome do not show a hypersensitive reaction to this type of tactile stimulus. Mixed type of tactile sensory response has 20% of children with autism, 33.33% of children with Down syndrome, 6.67% of children with hearing impairment and 13.33% of children with sight impairment. Normal sensory response shows 46.67% of children with autism, 40% of children with Down syndrome, 86.67% of children with hearing impairment and 73.33% of children with sight impairment.

Table 5. Frequencies and percentages of respondents' responses for the variable "Hygienic activities such as washing and washing hair, combing, cutting nails, brushing teeth"

Groups of respondents	Avoids		Seeks		Mixed		Neutral		Total	
	N	%	N	%	N	%	N	%	N	%
Autism	4	26.67	2	13.33	8	53.33	1	6.67	15	100
Down syndrome	4	26.67	0	0.00	7	46.67	4	26.67	15	100
Hearing impairment	1	6.67	3	20.00	0	0.00	11	73.33	15	100
Sight impairment	1	6.67	1	6.67	4	26.67	9	60.00	15	100

Hypersensitive reaction to this type of sensory input has 26.67% of children with Down syndrome and 6.67% of children with sight impairment. Children with autism and children with hearing impairment do not show a hypersensitive reaction to this type of tactile stimulus. Hyposensitive type of tactile sensory response has 20% of children with autism, 6.67% of children with Down syndrome and 13.33% of children with sight impairment. Children with hearing impairment do not show a hyposensitive reaction to this type of tactile stimulus. A mixed type of tactile sensory response has 60% of children with autism, 26.67% of children with Down syndrome, 6.67% of children with hearing impairment and 13.33% of children with sight impairment. Normal sensory response has 20% of children with autism, 40% of children with Down syndrome, 93.33% of children with hearing impairment and 66.67% of children with sight impairment.

Table 6. Frequencies and percentages of respondents' responses for the variable "Bathing, showering or swimming"

Groups of respondents	Avoids		Seeks		Mixed		Neutral		Total	
	N	%	N	%	N	%	N	%	N	%
Autism	0	0.00	3	20.00	9	60.00	3	20.00	15	100

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Down syndrome	4	26.67	1	6.67	4	26.67	6	40.00	15	100
Hearing impairment	0	0.00	0	0.00	1	6.67	14	93.33	15	100
Sight impairment	1	6.67	2	13.33	2	13.33	10	66.67	15	100

A hypersensitive reaction to this type of sensory input has 33.33% of children with autism, 26.67% of children with Down syndrome and 6.67% of children with sight impairment. Children with hearing impairment do not show a hypersensitive reaction to this type of tactile stimulus. Hyposensitive type of tactile sensory response has 20% of children with autism and 6.67% of children with sight impairment. Children with hearing impairment and children with Down syndrome do not show a hyposensitive reaction to this type of tactile stimulus. Mixed type of tactile sensory response has 40% of children with autism, 26.67% of children with Down syndrome and 13.33% of children with hearing impairment and children with sight impairment. Normal sensory response has 6.67% of children with autism, 46.67% of children with Down syndrome, 86.67% of children with hearing impairment and 73.33% of children with sight impairment.

Table 7. Frequencies and percentages of respondents' responses for the variable "Towel drying"

Groups of respondents	Avoids		Seeks		Mixed		Neutral		Total	
	N	%	N	%	N	%	N	%	N	%
Autism	5	33.33	3	20.00	6	40.00	1	6.67	15	100
Down syndrome	4	26.67	0	0.00	4	26.67	7	46.67	15	100
Hearing impairment	0	0.00	0	0.00	2	13.33	13	86.67	15	100
Sight impairment	1	6.67	1	6.67	2	13.33	11	73.33	15	100

Hypersensitive reaction to this type of sensory input has 66.67% of children with autism, 53.33% of children with Down syndrome, 26.67% of children with sight impairment and 13.33% of children with hearing impairment. Hyposensitive type of tactile sensory response has 13.33% of children with autism and 6.67% of children with Down syndrome. Children with hearing and vision impairment do not have a hyposensitive type of response to this type of sensory input. A mixed type of tactile sensory response has 20% of children with autism and Down syndrome, and 13.33% of children with sight impairment. Normal sensory response has 86.67% of children with hearing impairment, 60% with sight impairment, 20% of children with Down syndrome. There are no children with autism who show a normal sensory response to this type of tactile sensory input.

Table 8. Frequencies and percentages of respondents' responses for the variable “Trying new foods”

Groups of respondents	Avoids		Seeks		Mixed		Neutral		Total	
	N	%	N	%	N	%	N	%	N	%
Autism	10	66.67	2	13.33	3	20.00	0	0.00	15	100
Down syndrome	8	53.33	1	6.67	3	20.00	3	20.00	15	100
Hearing impairment	2	13.33	0	0.00	0	0.00	13	86.67	15	100
Sight impairment	4	26.67	0	0.00	2	13.33	9	60.00	15	100

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Hypersensitive reaction to this type of sensory input has 33.33% of children with autism, 53.33% of children with Down syndrome and 13.33% of children with sight impairment. Children with hearing impairment do not have a hypersensitive reaction to this type of tactile sensory input. Hyposensitive type of tactile sensory response has 6.67% of children with Down syndrome. Other subjects do not have a hyposensitive reaction to this type of tactile stimulus. A mixed type of tactile sensory response has 60% of children with autism, 20% of children with Down syndrome and 26.67% of children with sight impairment. Children with hearing impairment do not have a mixed reaction to this type of tactile sensory input. Normal sensory response has 6.67% of children with autism, 20% of children with Down syndrome, 100% of children with hearing impairment and 60% of children with sight impairment.

Table 9. Frequencies and percentages of respondents' responses for the variable "Feeling of certain foods in the mouth"

Groups of respondents	Avoids		Seeks		Mixed		Neutral		Total	
	N	%	N	%	N	%	N	%	N	%
Autism	5	33.33	0	0.00	9	60.00	1	6.67	15	100
Down syndrome	8	53.33	1	6.67	3	20.00	3	20.00	15	100
Hearing impairment	0	0.00	0	0.00	0	0.00	15	100	15	100
Sight impairment	2	13.33	0	0.00	4	26.67	9	60.00	15	100

A hypersensitive reaction to this type of sensory input has 20% of children with autism, 13.33% of children with Down syndrome and 6.67% of children with sight impairment. Children with hearing impairment do not have a hypersensitive reaction to this type of tactile sensory input. Hyposensitive type of tactile sensory response has 40% of children with autism and 6.67% of children with Down syndrome and children with sight impairment. Children with hearing impairment do not have a hyposensitive reaction to this type of tactile sensory input. Mixed type of tactile sensory response has 20% of children with autism, 40% of children with Down syndrome, 13.33% of children with hearing impairment and 26.67% of children with sight impairment. A normal sensory response shows 20% of children with autism, 40% of children with Down syndrome, 86.67% of children with hearing impairment and 60% of children with sight impairment.

Table 10. Frequencies and percentages of respondents' responses for the variable “Staying close to other people”

Groups of respondents	Avoids		Seeks		Mixed		Neutral		Total	
	N	%	N	%	N	%	N	%	N	%
Autism	3	20.00	6	40.00	3	20.00	3	20.00	15	100
Down syndrome	2	13.33	1	6.67	6	40.00	6	40.00	15	100
Hearing impairment	0	0.00	0	0.00	2	13.33	13	86.67	15	100
Sight impairment	1	6.67	1	6.67	4	26.67	9	60.00	15	100

Hypersensitive reaction to this type of sensory input has 40% of children with autism and 13.33% of children with Down syndrome, children with hearing impairment and children with sight impairment. Hyposensitive type of tactile sensory response has 26.67% of children with autism and 13.33% of children with hearing impairment and children with sight impairment. Children with Down syndrome do not have a hyposensitive reaction to this type of

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tactile sensory input. A mixed type of tactile sensory response 20% of children with autism and children with Down syndrome, and 13.33% of children with sight impairment. Children with hearing impairment do not have a mixed reaction to this type of tactile sensory input. Normal sensory response has 13.33% of children with autism, 66.67% of children with Down syndrome, 73.33% of children with hearing impairment and 60% of children with sight impairment.

Table 11. Frequencies and percentages of respondents' responses for the variable "Walking barefoot"

Groups of respondents	Avoids		Seeks		Mixed		Neutral		Total	
	N	%	N	%	N	%	N	%	N	%
Autism	6	40.00	4	26.67	3	20.00	2	13.33	15	100
Down syndrome	2	13.33	0	0.00	3	20.00	10	66.67	15	100
Hearing impairment	2	13.33	2	13.33	0	0.00	11	73.33	15	100
Sight impairment	2	13.33	2	13.33	2	13.33	9	60.00	15	100

3.2. Frequencies and percentages of responses of the total sample of respondents

Normal sensory integration in all variables of the assessment instrument has 13.33% of children with autism. The largest percentage of children with autism have a mixed type of tactile sensory response, 40% of them, and 26.67% of children are hypersensitive, while 20% are hyposensitive.

Normal sensory response of the tactile sensory system has 33.33% of children with Down syndrome. Mixed type of tactile sensory response has 33.33% of children. From baseline, 26.67% are hypersensitive and 6.67% of children with Down syndrome are hyposensitive.

Most children with hearing impairment, 80% of them have a neutral sensory response, or normal sensory integration of the tactile sensory system. 6.67% of children with hearing impairment have a mixed type of tactile sensory response, and the same number are hypersensitive or hyposensitive.

Most children with sight impairment, 60% of them have a neutral sensory response, or normal sensory integration. 20% of children with sight impairment have a mixed type of tactile sensory response, and 13.33% of children are hypersensitive. 6.67% of children with sight impairment are hyposensitive.

Table 12. Analysis of frequencies and percentages of the total sample of respondents for all variables of the assessment instrument

Groups of respondents	Avoids		Seeks		Mixed		Neutral		Total	
	N	%	N	%	N	%	N	%	N	%
Autism	4	26.67	3	20.00	6	40.00	2	13.33	15	100
Down syndrome	4	26.67	1	6.67	5	33.33	5	33.33	15	100
Hearing impairment	1	6.67	1	6.67	1	6.67	12	80.00	15	100
Sight impairment	2	13.33	1	6.67	3	20.00	9	60.00	15	100

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3.3. Differences in the representation of the difficulties of sensory integration of the tactile sensory system in relation to the type of disability

Inspecting the ranks of the matrix of representation of differences in tactile sensory system in relation to the type of disability, it can be stated that for the variable "*Touching certain parts of the body, hugs and caresses*" the best results, i.e., the least difficulties of tactile sensory system show children with hearing impairment (42.63), then children with sight impairment (34.63), and children with Down syndrome (23.70). Children with autism show the worst results, i.e., the greatest difficulties of the tactile sensory system (21.03).

For the variable "*Certain types of fabric, seams, labels, belts, cuffs, etc.*" children with hearing impairment have the least disability with the tactile sensory system (40.17), followed by children with sight impairment (34.77), and children with Down syndrome (26.23). Children with autism show the worst results, i.e., the greatest difficulties of the tactile sensory system (20.83).

The least difficult tactile sensory system for the variable "*Clothing, footwear or jewelry that is very narrow or very loose*" have children with hearing impairment (37.97), then children with sight impairment (33.93), and children with autism (26.63). Children with Down syndrome show the worst results, i.e., the greatest difficulties of the tactile sensory system (23.47).

For the variable "*Contamination of hands, face or other parts of the body with paint, glue, sand, food, lotion*" the least difficult are children with hearing impairment (42.50), followed by children with sight impairment (34.00), and children with Down syndrome (28.00). Children with autism show the worst results, i.e., the greatest difficulties of the tactile sensory system (17.50).

The best results of the tactile sensory system for the variable "*Hygienic activities such as washing face and washing hair, combing, cutting nails, brushing teeth*" are shown by children with hearing impairment (42.53), then children with sight impairment (35.13), and children with Down syndrome (24.80). Children with autism show the worst results, i.e., the greatest difficulties of the tactile sensory system (19.53).

For the variable "*Bathing, showering or swimming*", children with hearing impairment show the best results on this type of tactile sensory input (41.63), followed by children with sight impairment (34.87), and children with Down syndrome (27.20). Children with autism show the greatest difficulties with this tactile sensory input (18.30).

Children with hearing impairment have the least difficulties with the tactile system for the variable "*Towel drying*" (39.13), followed by children with sight impairment (36.13), and children with Down syndrome (28.27). Children with autism show the worst results, i.e., the greatest difficulties of the tactile sensory system (15.50).

For the variable "*Trying new foods*", children with hearing impairment show the best results, i.e., they have the least difficulties (44.53), followed by children with sight impairment (35.27), and children with Down syndrome (23.70). entries are shown by children with autism (18.50).

For the variable "*Feeling of certain foods in the mouth (e.g., dry, crumbly, smooth, mushy, crunchy)*" children with hearing impairment have the least disability (46.50), then children with sight impairment (33.43), and children with Down syndrome (25.70), and the worst results on this type of tactile sensory input are shown by children with autism (16.37).

Children with hearing impairment (40.07), children with sight impairment (32.13), and children with Down syndrome (25.70) have the least disability with the tactile sensory system for the variable "*Standing close to other people*". Children with autism show the worst results on this type of tactile sensory input (24.10).

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Children with hearing impairment (37.57) have the best results for the variable "*Walking barefoot*", followed by children with Down syndrome (33.03), and children with sight impairment (32.23). Children with autism have the greatest disability with this type of stimulus (19.17).

With an insight into the ranks of the matrices of representation of differences in tactile sensory system reactions, in relation to the type of disability, for all variables of the assessment instrument, it can be stated that the best results, i.e., the least difficulties of sensory integration of tactile sensory system show children with hearing impairment (43.97). children with sight impairment (35.03), and children with Down syndrome (25.07). Children with autism show the worst results, i.e., the greatest difficulties of sensory integration of the tactile sensory system (14.93).

Table 13. Differences in the representation of difficulties of sensory integration of tactile sensory system in relation to the type of disability

Variable	Groups	N	Rank M
Touching some parts of the body, hugs and caresses	Autism	15	21.03
	Down syndrome	15	23.70
	Hearing impairment	15	42.63
	Sight impairment	15	34.63
	Total	60	
Certain types of fabric, seams, labels, belts, cuffs, etc.	Autism	15	20.83
	Down syndrome	15	26.23
	Hearing impairment	15	40.17
	Sight impairment	15	34.77
	Total	60	
Clothing, footwear or embellishments that are very narrow or very loose	Autism	15	26.63
	Down syndrome	15	23.47
	Hearing impairment	15	37.97
	Sight impairment	15	33.93
	Total	60	
Contamination of hands, face or other parts of the body with paint, glue, sand, food, lotion	Autism	15	17.50
	Down syndrome	15	28.00
	Hearing impairment	15	42.50
	Sight impairment	15	34.00
	Total	60	
Hygienic activities such as washing face and washing hair, combing, cutting nails, brushing teeth	Autism	15	19.53
	Down syndrome	15	24.80
	Hearing impairment	15	42.53
	Sight impairment	15	35.13
	Total	60	
Bathing, showering or swimming	Autism	15	18.30
	Down syndrome	15	27.20
	Hearing impairment	15	41.63
	Sight impairment	15	34.87

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	Total	60	
Towel drying	Autism	15	15.50
	Down syndrome	15	28.27
	Hearing impairment	15	39.13
	Sight impairment	15	36.13
	Total	60	
Trying new food	Autism	15	18.50
	Down syndrome	15	23.70
	Hearing impairment	15	44.53
	Sight impairment	15	35.27
	Total	60	
Sensation of certain foods in the mouth (e.g., dry, crumbly, smooth ....)	Autism	15	16.37
	Down syndrome	15	25.70
	Hearing impairment	15	46.50
	Sight impairment	15	33.43
	Total	60	
Standing close to other people	Autism	15	24.10
	Down syndrome	15	25.70
	Hearing impairment	15	40.07
	Sight impairment	15	32.13
	Total	60	
Walking barefoot	Autism	15	19.17
	Down syndrome	15	33.03
	Hearing impairment	15	37.57
	Sight impairment	15	32.23
	Total	60	
Tactile sensory system	Autism	15	14.93
	Down syndrome	15	25.07
	Hearing impairment	15	43.97
	Sight impairment	15	35.03
	Total	60	

3.4. Statistically significant differences between children with developmental disabilities in relation to the type of disability

Inspecting Table 14, it can be stated that at the level of statistical significance of $p < 0.05$ there is a statistically significant difference in sensory integration difficulties between 4 groups of children with disabilities, by all variables of the assessment instrument, as well as the value of the total result tactile sensory system.

Also, it can be stated that the best results on the overall result of the tactile sensory system are achieved by subjects with hearing impairment, followed by subjects with sight impairment and subjects with Down syndrome, while the worst results are achieved by subjects with autism.

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Table 14. Statistically significant differences between children with disabilities in relation to the type of disability

Variables	Chi-Square	df	p
Touching some parts of the body, hugs and caresses	16.770	3	0.001
Certain types of fabric, seams, labels, belts, cuffs, etc.	14.320	3	0.003
Clothing, footwear or embellishments that are very narrow or very loose	8.635	3	0.035
Contamination of hands, face or other parts of the body with paint, glue, sand, food, lotion	19.317	3	0.000
Hygienic activities such as washing face and washing hair, combing, cutting nails, brushing teeth	17.887	3	0.000
Bathing, showering or swimming	18.411	3	0.000
Towel drying	19.657	3	0.000
Trying new food	24.160	3	0.000
Sensation of certain foods in the mouth (e.g., dry, crumbly, smooth ....)	27.850	3	0.000
Standing close to other people	9.328	3	0.025
Walking barefoot	11.415	3	0.010
Tactile sensory system	23.756	3	0.000

Conclusions

Difficulties with sensory integration of the tactile system has 86.67% of children with autism, of which 40% of children have a mixed type of response, 26.67% of children are hypersensitive, while 20% are hyposensitive.

Difficulties with sensory integration of the tactile system has 66.67% of children with Down syndrome, of which 33.33% of children have a mixed type of response, 26.67% are hypersensitive, and 6.67% of children are hyposensitive.

Difficulties with sensory integration of the tactile system has 20% of children with hearing impairment. Types of sensory response are evenly represented, 6.67% of children are hypersensitive, hyposensitive or show a mixed type of sensory response.

Difficulties with sensory integration of the tactile system has 40% of children with sight impairment, of which 20% of children have a mixed type of tactile sensory response, 13.33% of children are hypersensitive and 6.67% of children are hyposensitive.

Children with hearing impairment (Rank M 43.97), children with sight impairment (Rank M 35.03), and children with Down syndrome (Rank M 25.07) show the least disability in sensory integration of the tactile sensory system. Children with autism show the greatest difficulties in sensory integration of the tactile sensory system (Rank M 14.93).

There is a statistically significant difference in the difficulties of sensory integration of the tactile sensory system between children with autism, children with Down syndrome, children with hearing impairment and children with sight impairment, for all variables of the assessment instrument, as well as the value of the total score, at the level of statistical significance of $p<0.05$.

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