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Characteristics and predictors of auto-stimulatory behavior in children with autism

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ABSTRACT
The aim of this research was to examine characteristics and predictors of auto stimulatory behavior in children with autism spectrum disorders (ASD), as well as to determine the presence of auto stimulatory behavior exhibited by children with ASD. The sample included 43 participants diagnosed with ASD. The instrument used was *Behavior Problems Inventory* (BPI-01, Rojahn et al., 2002), subscale for stereotyped behavior. Our results show that children with ASD from our sample have lower rates of auto stimulatory behavior, with the most common ones being repetitive body movements, arm shaking, bouncing around, running and pacing. The school type has not proven to be a predictor of auto stimulatory behaviors. However, male participants and those with low functioning ASD exhibit more auto stimulatory behaviors than females and those with high functioning ASD. The presence of auto stimulatory behaviors persists through age. Auto-stimulatory behaviors exhibited by children with ASD can be reduced or eliminated, however it is important to use evidence-based interventions with proven benefits for the child. Since stereotypy is usually automatically maintained and therefore is one of the behaviors that is often difficult to reduce, it is recommended that parents are taught on how to implement interventions in their home environment.

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INTRODUCTION

Autism spectrum disorder (ASD) is a developmental disorder that affects communication and behavior. Although it can be diagnosed at any age, symptoms generally appear in the first two years of life. Children with ASD have difficulty with communication and interaction with other people, restricted interests and repetitive behaviors and symptoms that affect the person's ability to function in school and other areas of life (American Psychological Association, 2013). Having the number of children diagnosed with ASD rising, it is still unclear whether this is because of better detecting and reporting cases or actually a true increase within the number of cases, or both (Yadav, 2020).

Each child with ASD possesses an individual pattern of behavior and level of severity that impact the power to function, from low functioning to high functioning. A child in the spectrum may have limited, repetitive and stereotyped patterns of behavior (APA, 2013). These repetitive motor behaviors cause repetitive or unusual body movement or noises typically called stims (Ekblad & Pfuhl, 2017). Similar term used to describe this behavior is known as stereotypy. Although it may seem that this behavior has no purpose, there are researches who claim it is produced for the purpose of self-stimulation, a.k.a. auto stimulatory behaviors (Goldman et al., 2008).

Despite repetitive behaviors constitute one of two criteria that define ASD, there is not much available research to answer what is the function of this behavior. Some of them suggest that stereotypies offer autistic individuals a way to shut out the outside world. Others hold that they serve no function and simply reflect a disorganized nervous system (Deweerdt, 2020).

Typical of such behaviors are rhythmic rocking, pacing, aligning or spinning objects, hand or arm flapping, toe walking, twirling hair, jumping up and down etc. Sometimes the stimulation may be primarily visual, other times it may be vestibular, it may involve the body of an individual or the manipulation of objects (Lovaas et al., 1987). All sorts of auto-stimulatory behaviors are related to a range of emotions, such as being nervous, anxious, stressed, frustrated, anticipating, excited, angry or upset.

Some authors claim that stims are not expressed simply because a child has a diagnosis of ASD, but because one is stressed and anxious. Conducted research on this behavior still cannot distinguish whether stims are unintentional emotional expressions or whether they are intentionally done to communicate one's emotional state (Ekblad & Pfuhl, 2017). Being aware of auto stimulatory behavior as a means to express emotional state can facilitate social interactions for individuals in the spectrum and reduce their feeling of distress during social communication.

Although auto-stimulatory behavior seems to be harmless, for children with ASD who generally lack social and self-regulatory skills, these behaviors might interfere with school functioning or daily living activities. Stims are often perceived as age-inappropriate in form, focus, context, duration or intensity which may lead to children's involvement in the community, peer and adult interactions, or typical education settings becoming severely restricted (Cunningham & Schreibman, 2008). Further, discovering potential function of this behavior in children with ASD, as well as better understanding of its core and predictors that cause it could definitely make an impact on overall well-being of individuals in the spectrum.

Therefore, the aim of this research was to examine characteristics and predictors of auto stimulatory behavior in children with ASD, as well as to determine the presence of auto stimulatory behavior exhibited by children with ASD.

METHODS

Sample

The research was conducted during January and February of 2022 on a population of children with ASD. Instruments in a paper form were distributed to special educators that work in schools for educating children with disabilities, as well as to those who work in private practices in the territory of the Republic of Serbia. All special educators were told that the participation in the research is anonymous and voluntary and that they should fill out the questionnaires for children whom they work with for at least over six months. The sample included 43 participants diagnosed with ASD. Socio-demographic characteristics of the sample are presented in Table 1.

Instrument

The instrument used was *Behavior Problems Inventory* (BPI-01, Rojahn et al., 2002), subscale for stereotyped behavior. This instrument is used to measure frequency of different forms of auto stimulatory behavior exhibited by children with ASD. The frequency is measured as 0 = never, 1 = monthly, 2 = weekly, 3 = daily, 4 = hourly. This subscale consists of 24 items, however we used only 18 of them in our survey modification, because of the similarities among some when translated into Serbian language. Items that were excluded from the survey referred to whirling, twirling things, having repetitive hand movements, engaging in complex hand and finger movements, exhibiting sustained finger movements and waving hands. The participants were supposed to mark only behaviors exhibited by the children in the last two months. The score was calculated by adding the values on each item, therefore the maximum score a participant can have

is 72 and it indicates the greatest frequency of stereotypy. Every score above 36 indicates that the child exhibits a lot of auto stimulatory behaviors. The reliability of the used instrument was α = .89.

Table 1. *Sample characteristics*

Variable	Category	f	%
Gender	Male	34	79.1
	Female	9	20.9
Age group	0-7	9	20.9
	8-15	19	44.2
	16-25	15	34.9
Functionality level	High functioning ASD	14	32.6
	Low functioning ASD	29	67.4
Type of school	Mainstream school	13	30.2
	School for educating children with special needs	30	69.8

Statistical analysis

Statistical analysis of the obtained data was performed by using Statistical Package for the Social Sciences (SPSS) program. Normality of the sample distribution was checked with the Shapiro-Wilk test. The reliability of the used instrument was obtained with Cronbach alpha. In order to determine if participants exhibit high rates of auto stimulatory behavior, we used t-test for a single sample. Man-Whitney test was performed in order to determine presence of auto stimulatory behavior among dichotomous categorical variables, while Kruskall-Wallis test was performed in order to determine differences in auto stimulatory behavior among polytomous categorical variables.

RESULTS AND DISCUSSION

In order to determine if participants exhibit high rates of auto stimulatory behavior, we used t-test for a single sample. The results of the t-test for a single sample show that the average value on the used instrument (N = 43, M = 29.58, SD = 18.32) in our sample indicates that all participants statistically significantly differ from the theoretical average of 36 points (t = -2.30, df = 42, p = .03), which indicates that they exhibit less auto stimulatory behaviors.

Auto stimulatory behaviors present early in the lives of young children with ASD (Morgan et al., 2008; Ozonoff et al., 2008; Watt et al., 2008; as cited in Boyd et al., 2012), while the prevalence of motor stereotypies is the highest. The average prevalence of stereotypy across studies in individuals with developmental disabilities was 61% with individuals with ASD having the highest reported prevalence, as high as 88% (Chebli et al., 2016).

Table 2 shows the descriptive statistics on the individual items of the subscale used. As it is shown in Table 2, auto stimulatory behaviors that are most commonly exhibited by our sample are repetitive body movements (M = 2.30), arm shaking (M = 2.21), bouncing around (M = 2.05), running and pacing (M = 2.00).

Many children with ASD engage in auto stimulatory behavior engaging repetitive motor and vocal behaviors. Most commonly they take on forms such as body rocking, mouthing, repetitive hand movements,

finger flicking, spinning, twirling, mouthing, toe walking, pacing, hand waving, object banging, repetitive vocalizations and repetitive posturing (Bodfish et al., 2000; MacDonald et al., 2007; Chebli et al., 2016).

Table 2. *Descriptive statistics on individual items* (*N* = 43)

Item	M	SD
Rocking back and forth	1.98	1.83
Sniffing objects	1.37	1.81
Spinning own body	1.47	1.84
Waving or shaking arms	2.21	1.73
Rolling head	1.56	1.79
Engaging in repetitive body movements	2.30	1.82
Pacing	2.00	1.80
Yelling and screaming	1.60	1.79
Sniffing own body	.74	1.43
Bouncing around	2.05	1.78
Spinning objects	1.88	1.79
Having bursts of running around	2.00	1.63
Manipulating objects repeatedly	1.63	1.68
Rubbing self	1.05	1.48
Gazing at hands or objects	1.91	1.69
Maintaining bizarre body postures	1.65	1.82
Clapping hands	.88	1.43
Grimacing	1.30	1.55

Differences in the presence of auto stimulatory behavior between participants of different genders, functionality levels and type of school they attend is presented in Table 3. In order to determine presence of auto stimulatory behavior among dichotomous categorical variables (gender, functionality level and type of school participants attend), we used Mann-Whitney test. The results of the Mann-Whitney test indicate that participants that attend mainstream schools and schools for educating children with special needs do not differ in terms of presence of auto stimulatory behavior (U = 135.50, p = .12). However, statistically significant differences were found between participants of different genders (U = 97.00, p = .09), where male participants exhibit more auto stimulatory behaviors (*Mdn* = 34.00) in comparison with female participants (*Mdn* = 23.00). Also, statistically significant differences were found between participants with different functionality levels (U = 116.50, p = .03), where participants with low functioning ASD exhibit more auto stimulatory behaviors (*Mdn* = 41.00) in comparison with participants with high functioning ASD (*Mdn* = 17.00).

Table 3. *Dichotomous categorical variables and presence of auto stimulatory behavior*

Variable	Category	N	Mdn	IQR
Gender	Female	9	23.00	29
	Male	34	34.00	34
Functionality level	High functioning ASD	14	17.00	15
	Low functioning ASD	29	41.00	39
Type of school	Mainstream school	13	48.00	40
	School for educating children with special needs	30	24.50	30

Grossi with his co-workers (Grossi et al., 2021) claim that gender was not associated with prevalence of auto stimulatory behavior in individuals with ASD. Same findings were reported by Freeman et al. (2010). When it comes to functionality level, our findings are consistent with previous research (Grossi et al., 2021).

Differences in the presence of auto stimulatory behavior between participants of different age groups are presented in Table 4.

Table 4. *Descriptive measures on presence of auto stimulatory behavior in terms of age group*

Age group	N	M	SD	Mdn	IQR
0-7	9	35.11	20.79	47.00	40
8-15	19	29.63	21.33	34.00	44
16-25	15	26.20	11.94	24.00	16

In order to determine differences in auto stimulatory behavior between participants of different age groups, Kruskall-Wallis test was performed. The results of Kruskall-Wallis test indicate that participants of different age groups statistically do not statistically significantly differ in the presence of auto stimulatory behavior (H = 1.09, df = 2, p = .58). Our findings are the opposite of results obtained by Chelbli et al (2016), who found that 61% of adults with ASD exhibit auto stimulatory stereotypy, while only 57% of children have it.

CONCLUSION

Our results show that children with ASD from our sample have lower rates of auto stimulatory behavior, with the most common ones being repetitive body movements, arm shaking, bouncing around, running and pacing. The school type has not proven to be a predictor of auto stimulatory behaviors. However, male participants and those with low functioning ASD exhibit more auto stimulatory behaviors than females and those with high functioning ASD. The presence of auto stimulatory behaviors persists through age.

Research shows that different auto stimulatory behaviors exhibited by children with ASD can be reduced or eliminated (Gajić et al., 2022a, 2022b), however it is important to use evidence based interventions with proven benefits for the child (Arsić et al., 2021a). Since stereotypy is usually automatically maintained and therefore is one of the behaviors that is often difficult to reduce (LeBlanc et al., 2000; Rapp, 2006; Rooker et al., 2018; Shawler et al., 2022), it is recommended that parents are taught on how to

implement interventions in their home environment (Arsić et al., 2021b). The biggest limitation of this research is sample size, therefore we recommend that replication is implemented on a larger sample.

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