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RESEARCH ARTICLE

CHILDREN WITH AUITSM SPECTRUM DISORDER AND PATTERNS OF PARTICIPATION IN DAILY PHYSICAL AND PLAY ACTIVITY

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Abstract:

Children with Autism Spectrum Disorder (ASD) often face challenges in motor development and physical activity, leading to reduced participation in organized activities and an increased risk of comorbid conditions such as obesity. This study aims to explore the diversity and significance of play in children with ASD. The objective was to understand the diversity of autistic play and its significance, in assessing play levels in children with autism, evaluate diversity in daily activity participation and Correlate autism severity with play participation.

The study utilizes the WESTBY scale, Pre-linguistic Scale 5, Vineland Social Maturity Scale (VSMS), and Social Responsivenes Scale-2 (SRS-2) to assess play levels, language, and social maturity in children with ASD, respectively. It was observed that most children were at Stage 1 (74%) or Stage 2 (26%) on the WESTBY Play Scale. Significant differences in physical activity participation were noted, with jumping and running being more popular. Correlations were found between play participation and autism severity, social communication, and social maturity.

The findings suggest that tailored interventions to enhance physical activity and social skills in children with ASD are crucial for improving their quality of life and addressing comorbid conditions.

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Background:

Children with ASD are less likely to participate in organized activities like sports [1]. This is attributed to their deficits in motor development and physical activity (PA) behaviour. Social and behavioural impairments in ASD limit

children's opportunity to participate in PA and recreations that eventually end to their inactivity predisposing children with ASD to comorbid conditions such as overweight and obesity[1].

ASD is clinically defined by impairments in social, communication and reciprocal interaction, with repetitive, restricted, and stereotypical behavioral patterns and is now thought to affect up to 2.5% of children [1]. Social impairment and restricted interests combined with high rates of motor problems. PA helps socialization, increase motor skills, and have positive impacts on a range of outcomes [2].

Disturbing statistics suggest that children with autism are 40% more likely to be overweight and obese compared to their typically developed peers. Increasing PA is a primary health objective. Thusalthough motor skill difficulties have started to receive more attention in autism literature, PA patterns have received less [3]. Comorbid conditions can significantly impact children with Autism Spectrum Disorder (ASD). Quite often, the comorbidities are related to the key manifestations of ASD itself, like-

1. **Physical Health:** Conditions like overweight and obesity are common due to reduced physical activity. This can lead to further health issues such as diabetes, cardiovascular problems, and joint pain.
2. **Mental Health:** Children with ASD are also at a higher risk for mental health conditions like anxiety, depression, and ADHD. These can exacerbate social and behavioral challenges, making it even harder for them to engage in daily activities.
3. **Social Interaction:** Comorbid conditions can further limit social interactions. For example, obesity might lead to bullying or social isolation, which can worsen the child's social skills and self-esteem.
4. **Quality of Life:** Overall, these comorbid conditions can reduce the quality of life for children with ASD, making it crucial to address both the core symptoms of ASD and any additional health issues.

AIM-The study aims at understanding the diversity of autistic play and its level of significance.

OBJECTIVE

1) To assess, the level of play in children with autism.
2) To assess, the diversity in participation of daily activities.
3) To understand correlation between severity of autism and level of participation in play.

Methodology:

Study design: The children whose parents gave consent were enrolled in the study. It was a cross sectional study meant to analyze the association of the levels of play and the severity of ASD symptoms.

Recruitment & Sampling method: the study involved only children with autism. Hence those parents who were willing to participate only were included; hence convenience sampling method was selected.

Sample size: Using Open Epi software the sample size of the study population was found to be 41 with an expected incidence of the population as 2.5% and an alpha of 0.05 at 80% power and design effect size of 2.5 for surveys. Using the formula N=(Za)

65 patients were initially recruited of which 10 dropped out at different levels.

Methods:

Assessments:

a) The level of play for each child was assessed with WESBY's Play Scale (WPS). The Westby Play Scale is designed to be sensitive to various stages of symbolic play, which are closely linked to cognitive and language development. However, specific sensitivity and specificity values for the Westby Play Scale are not commonly reported in the literature. This scale is more qualitative, focusing on the developmental milestones and the types of play behaviours that should be observed at different ages.

b) The appropriate language level of each child was assessed using the PLS-5.The Preschool Language Scale, Fifth Edition (PLS-5) has a sensitivity of 0.83 and a specificity of 0.8012. These values indicate that the PLS-5 is quite effective in correctly identifying children with language delays (sensitivity) and in correctly identifying children without language delays.

c) The social responsiveness levels of the child was determined with SRS-2.

d) And the behavioural abnormality and social quotient was assessed using VSMS. Interview of each parent was done and questionnaires were filled up along with observations by the DBP. Any deficiencies were subjected to reconfirmation with the parents. The results were tabulated and analyzed using appropriate statistical methods

Statistical analysis:

SPSS-23 version was used for statistical analysis. Frequency distributions with mean +/- SD were calculated for parametric data and median with IQR for the nonparametric distributions. Shapiro-Wilk testing was done to ensure parametric quality of data. No normalization of data was done. Chi-square was done for comparing the observed play with the expected. Pearson's correlation was done to analyze the comparability of levels of play with the severity levels of ASD.

Results:

Table 1: Assessment of play using Wes by Play Scale (WPS)

WPS Stages	N	%
Stage 1	37	74
Stage 2	13	26

If the same assessment is applied to a larger group, we can predict similar distributions. For example, if 100 children are assessed, we might expect:

- Stage 1: (74%) of 100 = 74 children
- Stage 2: (26%) of 100 = 26 children

If interventions or educational programs are introduced, tracking the movement of children from Stage 1 to Stage 2 over time can help measure the effectiveness of these programs. Most children are found to be in the Stage 1 (74%), as assessed by the WPS (Table 1).

Table 2: Assessing the diversity of participation in physical activities

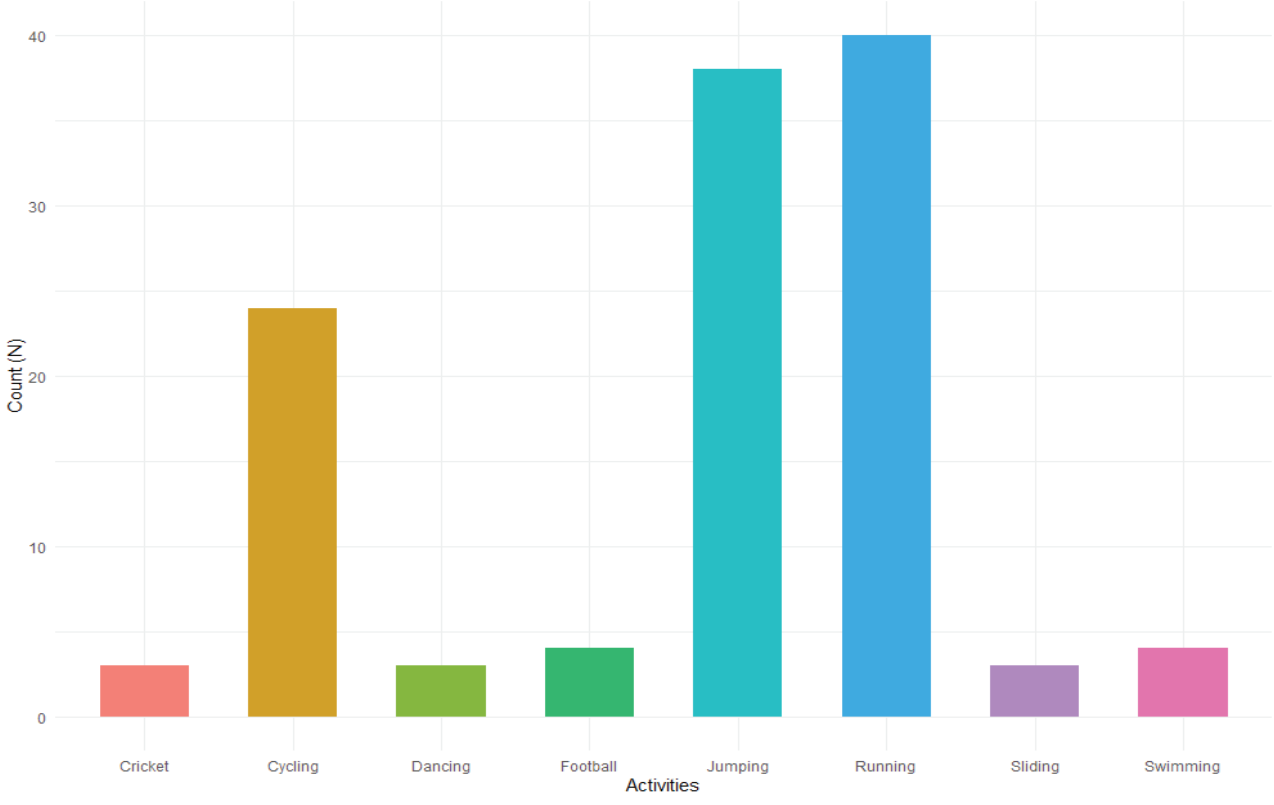
Activities	Observed N	Expected N	x^2
Cricket	3	14.9	128.328**
Cycling	24	14.9	
Dancing	3	14.9	
Football	4	14.9	
Jumping	38	14.9	
Running	40	14.9	
Sliding	3	14.9	
Swimming	4	14.9	

***** p < 0.001***

Jumping and Running have much higher observed frequencies compared to the expected frequencies, indicating these activities are significantly more popular than expected (Table 2).

Dancing, Football, Sliding, and Swimming have much lower observed frequencies compared to the expected frequencies, indicating these activities are significantly less popular than expected (Figure 1).

Fig 1: Bar plot showing the frequencies of the activities



A significant $\chi 2$ (goodness of fit test) among the activities implies there is significant difference (diversity) among the physical activities involved in, by the children. The observed and expected frequencies have been given in the (Table 2).

Table 3: t-test for BMI across the age and gender groups

Variables	Age	N	M	SD	T	Df	M_D	SE_D	p
Age	Below 5yrs	21	16.511	1.653	0.582	48	0.29	0.498	0.563
	Above 5yrs	29	15.221	1.793					
Gender	Male	33	16.097	1.95	-1.691	47.752	-0.722	0.427	0.097
	Female	17	16.819	1.067					

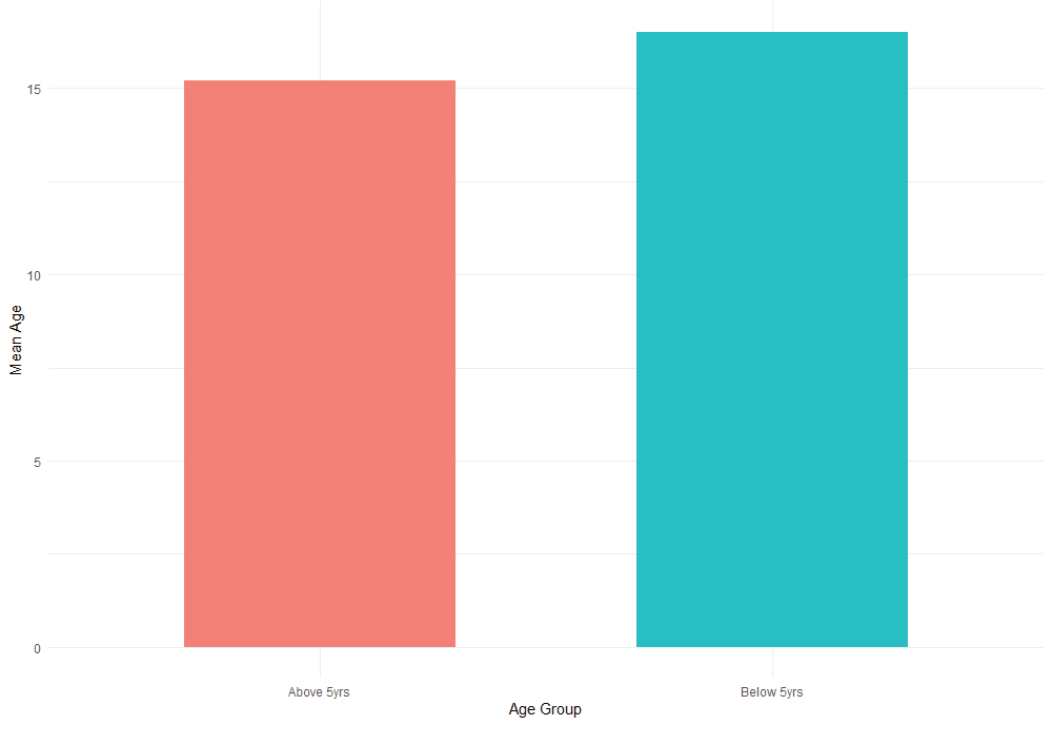
Variable: BMI

The above table reveals that there is no significant difference found among the age groups and the sexes in terms of the BMI of the autistic children (p = n.s.). However, children below 5 years were found to have a slightly higher mean BMI. Similarly, the females were found to possess slightly higher mean BMI than the males (Table 3).

a) Age Group Comparison:

- The mean score for children below 5 years is slightly higher than for those above 5 years.
- The p-value (0.563) indicates that the difference is not statistically significant, meaning there is no strong evidence to suggest a difference in means between the two age groups (Figure 2).

Fig 2: Bar plot showing the mean of the age groups



b) Gender Comparison:

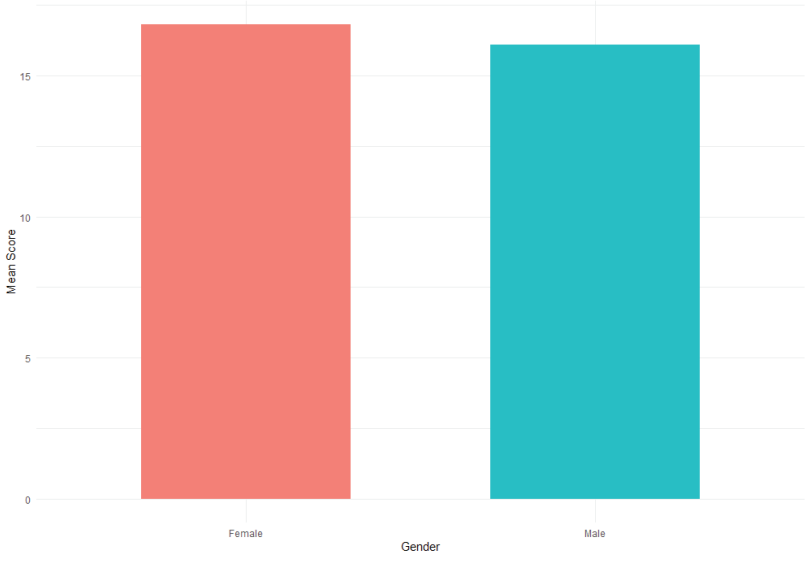
- The mean score for females is slightly higher than for males.
- The p-value (0.097) is close to the conventional threshold for significance (0.05), suggesting a potential difference, but it is not statistically significant at the 0.05 level (Figure 3).

Fig 3: Bar plot showing the mean of the gender group

Variable	Statistics	SCI	RRB	VSMS	PLS-5 Auditory	PLS-5 Expressive	SRS-2
WPS Stages	R	-.645**	-.077	.658**	571*	0.426**	-.580*
	P	0.000	0.594	0.000	0.000	0.002	0.000

** $p < 0.01$ * $p < 0$

Table 4: Correlation between level of participation in play and variables related to the severity of autism



Variables and Correlations:

a) **SCI (Social Communication and Interaction):**

- **Correlation ®:** -0.645**
- **p-value:** 0.000
- **Inference:** There is a strong negative correlation between level of participation in play and social communication and interaction.Highersocial communication and interaction is associated with lower level of participation in play (Table 4).

b) **RRB (Restricted and Repetitive Behaviors):**
- **Correlation ®:** 0.077
- **p-value:** 0.594
- **Inference:** There is no significant correlation between participation in play and restricted and repetitive behaviors.

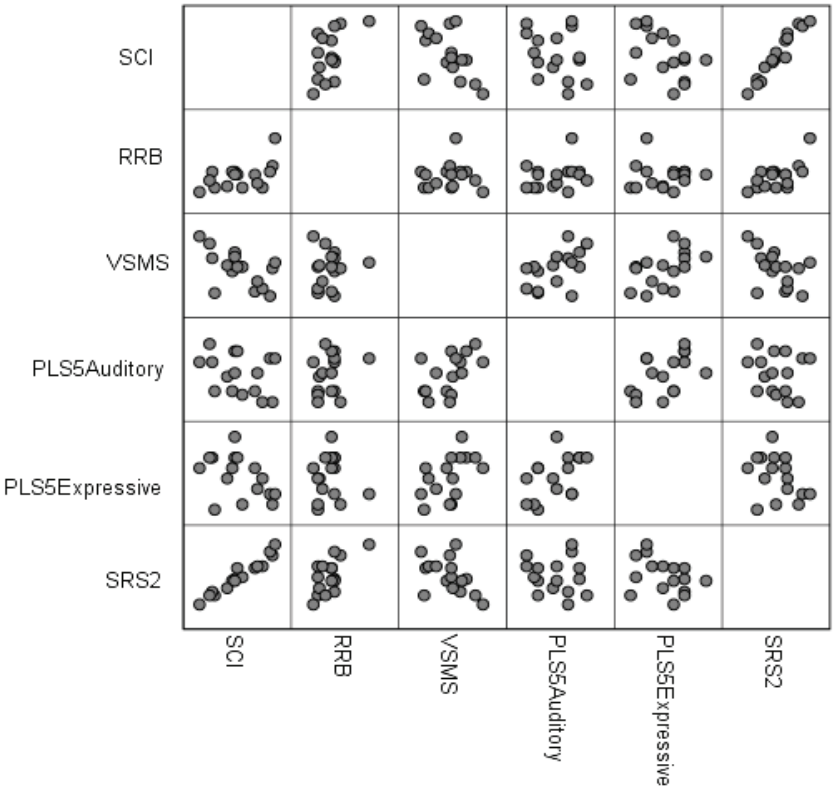
c) **VSMS (Vineland Social maturity Scale):**
- **Correlation ®:** 0.658**
- **p-value:** 0.000
- **Inference:** There is a strong between level of participation in play and social maturity. Better social maturity is associated with higher participation in play.

d) **PLS-5 Auditory Comprehension:**
- **Correlation ®:** 0.658**
- **p-value:** 0.000
- **Inference:** There is a strong positive correlation between participation in play and auditory comprehension. Better auditory comprehension is associated with higher participation in play.

e) **PLS-5 Expressive:**
- **Correlation ®:** 0.571*
- **p-value:** 0.002
- **Inference:** There is no significant correlation between level of participation in play and expressive language skills.

f) **SRS-2 (Social Responsiveness Scale):**
- **Correlation ®:** -0.580**
- **p-value:** 0.000
- **Inference:** There is a moderate negative correlation between participation in play and social responsiveness. The severity in social responsiveness issues is associated with lower participation in play.

Fig 4: Correlogram for the variables



It is observedthat there is a strong negative correlation between WPS Stages and SCI (r= −.645, p=.000), indicating that as WPS Stages increase, SCI decreases significantly. There exists a strong positive correlation between WPS Stages and VSMS, (r= .658, p=.000), and a moderate positive correlation with Auditory Comprehension (r= .571, p=.000), suggesting that higher WPS Stages are associated with higher scores in these areas. Also, a moderate negative correlation was observed between WPS Stages and SRS-2 (r= −.580, p=.000), indicating that higher WPS Stages are associated with lower SRS-2 scores. However, the correlations between WPS Stages and RRB (r=−.077, p=.594) and Expressive Comprehension (r= .426, p=.002) were not statistically significant implying that WPS Stages are significantly related to certain aspects of autism severity, particularly SCI, VSMS, and SRS2. It is not linked significantly with restricted interests and restricted behaviours and the expressive comprehension, as assessed by PLS-5 (Figure 4).

Discussion:

ASD components: SCI is inversely correlating with the play stages, but RRB does not correlate with stages of play.Children with ASD often exhibit delays in spontaneous pretend play compared to typically developing peers. Pretend play involves symbolic thinking and creativity. However, the relationship between RRBs and play stages isn't straightforward. While RRBs may interfere with certain play behaviors (e.g., rigid adherence to routines), they don't always correlate directly with play development [4, 5]. So, even though RRBs are common in ASD, they don't necessarily predict play stage progression.

VSMS: There exists a strong positive correlation between WPS Stages and VSMS, (r= .658, p=.000). This shows that social quotient of VSMS can reliably be used not just in analyzing sociability, but in analyzing how to play with the child. While the exact correlation with the Vineland Social Maturity Scale (VSMS) isn't directly covered in thisreview"A Systematic Review of Play-Based Interventions Targeting the Social Communication Skills of Children with ASD", understanding the impact of play-based interventions on social communication remains crucial for children with ASD[6]. Play-based interventions, recognizing that play offers a unique context for social communication development, especially in educational environments.

PLS-5: There exists a moderate positive correlation with Auditory Comprehension (r= .571, p=.000), suggesting that higher WPS Stages are associated with higher scores in these areas. However, the expressive part of it though is returning a significant p-value cannot be considered as r valueis <0.5; hence expressive language is not significantly correlating with the stages of play.A recent study titled "Neurophysiological measures of auditory sensory processing are associated with adaptive behavior in children with Autism Spectrum Disorder" investigated the relationship between early auditory processing (measured through auditory event-related potentials) and everyday adaptive behavior in children with ASD[7]. Atypical auditory cortical processing (smaller and/or slightly delayed auditory evoked potentials) was consistently found in children with ASD. Lateralization of auditory event-related potentials (AEPs) was significantly associated with adaptive functioning in the socialization domain.Sensory processing differences may impact everyday adaptive behavior in autism [7].

SRS-2: A moderate negative correlation was observed between WPS Stages and SRS-2 (r=

−.580, p=.000), indicating that higher WPS Stages are associated with lower SRS-2 scores. Although not directly related to WPS Stages, this study'Performance of the SRS-2 for Assessment of Neurodevelopmental Conditions" explored correlations between SRS-2 scores and other cognitive measures.A small negative correlation was observed between SRS-2 total T-score and various cognitive subtests [8].

Conclusion:

Study gives information on the similarity in level of play and social responsiveness. Level of play and severity of Autism are not related with respect to RRB, but is strongly related to SCI of SRS-2. Better social maturity and improved auditory comprehension are linked to higher levels of play participation in children with Autism Spectrum Disorder (ASD). On the other hand, greater severity in social responsiveness issues tends to be associated with lower engagement in play activities.

Stages of play closely correlate with social quotient. Children with ASD prefer solitary play to other type of play like parallel & Co-operating play; by age 4 years they the directly go to constrictive play. These children have a mild degree of autism severity with training developed pretend play and proceeded to different type of play. This differences in social responsiveness and play have to be considered while interacting with the child during activities.

These findings suggest that improving social communication and responsiveness, as well as auditory comprehension and expressive language skills, could enhance participation in play for children with autism. Programs focusing on enhancing social communication and language skills might be particularly effective in increasing play participation. Regular assessment of these variables can help tailor interventions to individual needs, potentially leading to better outcomes in play participation.

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Conflicts of interest:

There are no conflicts of interest

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