



Children with Autism Spectrum Disorder and Patterns of Participation in Daily Physical and Play Activities.

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Received: 03-12-2025

Revised: 22-12-2025

Accepted: 08-01-2026

Published: 27-02-2026

Abstract

Background: Children with Autism Spectrum Disorder (ASD) often exhibit differences in motor skills, social communication, and behavioral flexibility, which may influence their participation in physical and play activities. Understanding these patterns is essential for developing targeted interventions. This study examined the patterns of participation in daily physical and play activities among children with ASD compared to typically developing (TD) peers. **Methods:** A cross-sectional comparative study was conducted with 40 children aged 5–10 years (20 with ASD, 20 TD controls), recruited from a child development clinic and local schools. Participation was assessed using the Children's Assessment of Participation and Enjoyment (CAPE) and the Physical Activity Questionnaire for Children (PAQ-C). Parents completed additional measures including the Social Communication Questionnaire (SCQ) and the Vineland Adaptive Behavior Scales (VABS-II). Group differences were analyzed using independent t-tests and Mann-Whitney U tests. **Results:** Children with ASD participated in significantly fewer physical and play activities compared to TD peers ($p < .001$). They showed lower diversity (mean activities: ASD = 12.4, TD = 18.7, $p < .001$) and lower intensity of participation ($p < .001$). The greatest differences were observed in social play activities (e.g., team sports, group games) and unstructured outdoor play. Children with ASD preferred solitary and repetitive activities such as spinning objects, computer use, and watching videos. Higher ASD symptom severity correlated with lower participation diversity ($r = -0.62$, $p = .003$). **Conclusion:** Children with ASD demonstrate distinct patterns of restricted participation in daily physical and play activities, with a marked preference for solitary, screen-based, and repetitive activities. These findings highlight the need for structured support to facilitate inclusive physical activity opportunities and social play engagement in this population.

Keywords: Autism Spectrum Disorder, physical activity, play, participation, children, motor skills.



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INTRODUCTION

Autism Spectrum Disorder (ASD) is a neurodevelopmental condition characterized by persistent deficits in social communication and interaction, along with restricted, repetitive patterns of behavior, interests, or activities.¹ The global prevalence of ASD has risen substantially, with current estimates indicating that approximately 1 in 36 children is diagnosed with ASD.² Beyond the core diagnostic features, children with ASD frequently experience difficulties in motor coordination, sensory processing, and adaptive functioning, which can significantly impact their ability to engage in everyday activities.³

Participation in physical and play activities is a fundamental aspect of childhood development. Through play, children develop motor skills, social competence, emotional regulation, and cognitive abilities.⁴ Physical activity, in particular, is associated with numerous health benefits including cardiovascular fitness, bone health, weight management, and improved mental well-being.⁵ For children with ASD, however, participation in these activities is often compromised due to a combination of intrinsic factors (motor difficulties, social challenges, sensory sensitivities) and extrinsic barriers (lack of inclusive programs, parental concerns, environmental obstacles).⁶

Existing research suggests that children with ASD engage in lower levels of physical activity compared to their typically developing peers.⁷ A meta-analysis by Jones and colleagues (2017) reported that children with ASD spent significantly less time in moderate-to-vigorous physical activity and more time in sedentary behavior.⁸ Similarly, studies examining

play patterns have found that children with ASD demonstrate less varied play repertoires, prefer solitary and repetitive play, and exhibit reduced engagement in social and imaginative play.⁹

However, most existing studies have focused on either physical activity or play in isolation, rather than examining the integrated patterns of daily participation across both domains.¹⁰ Furthermore, few studies have systematically compared activity preferences between children with ASD and their typically developing peers using validated participation measures. Understanding these patterns is critical for designing interventions that promote inclusive, meaningful participation. The present study aimed to examine the patterns of participation in daily physical and play activities among children with ASD compared to typically developing (TD) peers.

METHODOLOGY

Study Design & population

A cross-sectional, comparative research design was employed to examine and compare the patterns of participation in daily physical and play activities between children with Autism Spectrum Disorder (ASD) and typically developing (TD) children. All children aged 5 to 10 years diagnosed with Autism Spectrum Disorder (ASD).

Inclusion Criteria – ASD Group:

- Age between 5 years 0 months and 10 years 11 months (inclusive)
- Confirmed clinical diagnosis of Autism Spectrum Disorder made by a child psychiatrist or developmental pediatrician according to DSM-5 criteria
- Social Communication Questionnaire (SCQ) score ≥ 15 , indicating clinically significant autism symptoms
- Parent or legal guardian able to read and understand English or the local language
- Written informed consent provided by parent/legal guardian

Inclusion Criteria – Typically Developing (TD) Group:

- Age between 5 years 0 months and 10 years 11 months (inclusive) and within ± 6 months of an ASD participant for age matching
- No known developmental, neurological, or psychiatric disorders as reported by parent or school records
- No first-degree relative with ASD
- Parent or legal guardian able to read and understand English or the local language
- Written informed consent provided by parent/legal guardian

Exclusion Criteria (Both Groups):

- Presence of significant motor impairment (e.g., cerebral palsy, muscular dystrophy, spina bifida) that independently limits physical activity participation
- Uncorrected visual or hearing impairment that would interfere with participation in play activities
- Severe intellectual disability (Vineland Adaptive Behavior Scales-II Adaptive Composite standard score < 40), as these children would be unable to complete or meaningfully participate in the assessment
- Acute medical illness (e.g., pneumonia, fracture) at the time of assessment
- Active seizure disorder not controlled on medication (for ASD group only)
- Child currently receiving intensive physical or occupational therapy (> 3 sessions per week) that might artificially inflate activity participation.

Sample size was calculated using G*Power software (version 3.1.9.7) for a two-group independent t-test, assuming a large effect size (Cohen's $d = 0.80$), $\alpha = 0.05$, power = 0.80, and an allocation ratio of 1. The analysis indicated a requirement of 21 participants per group (total $N = 42$). Accounting for a 5% attrition rate, the target was set at 22 per group (total $N = 44$). However, due to practical constraints in recruiting eligible and consenting ASD participants, the final sample comprised 20 participants per group (total $N = 40$), providing 76% power to detect a large effect, which was deemed acceptable for this exploratory study.

Procedure for Data Collection

The data collection process was conducted in four sequential phases over 12 months. For the ASD group, a research assistant reviewed the outpatient registry of the child development center to identify children aged 5–10 years with confirmed ASD; eligible families were contacted by telephone, and appointments were scheduled for interested families. For the TD group, three elementary school principals were approached for permission, following which information letters and consent forms were sent home with children in grades 1–5, and interested parents returned signed forms. At the scheduled appointment, parents completed screening measures (SCQ for ASD group; developmental history for TD group). A trained research team member explained the study in the parent's preferred language, obtained written informed consent from all parents, and verbal assent from children aged ≥ 8 years; participants were assigned unique study IDs with no

personal identifiers on data forms. All assessments were conducted in a quiet, private room at the respective site, with a fixed order: demographic questionnaire (5 min, interviewer-administered), SCQ (10 min, self-administered), VABS-II (15 min, semi-structured interview), CAPE (20 min, interviewer-administered with visual prompts), and PAQ-C or proxy (5–10 min, self-report with assistance). Immediately following assessment, all forms were reviewed for completeness; if >10% of items on any key measure were missing, the parent was asked to complete them. Parents in the ASD group received a handout on developmentally appropriate physical activities.

Statistical analysis was performed using SPSS version 26.0. Descriptive statistics (means, standard deviations, frequencies, and percentages) were computed for all demographic and clinical variables. Normality of continuous data was assessed using the Shapiro-Wilk test. Between-group differences (ASD vs. TD) were analyzed using independent t-tests for normally distributed variables (e.g., CAPE diversity, CAPE intensity, PAQ-C scores) and Mann-Whitney U tests for non-normally distributed variables. A p-value < 0.05 (two-tailed) was considered statistically significant.

RESULTS

Table 1: Participant Characteristics

Characteristic	ASD Group (n=20)	TD Group (n=20)	p-value
Age (years), mean (SD)	7.8 (1.6)	7.9 (1.5)	0.84
Gender, n (%)			0.76
Male	16 (80.0)	15 (75.0)	
Female	4 (20.0)	5 (25.0)	
Socioeconomic status, n (%)			0.62
Middle	12 (60.0)	14 (70.0)	
Upper-middle	8 (40.0)	6 (30.0)	
SCQ score, mean (SD)	22.4 (4.1)	4.2 (2.3)	<0.001
VABS-II Adaptive Composite, mean (SD)	68.5 (12.3)	104.2 (10.8)	<0.001

Table 1 presents the demographic and clinical characteristics of the ASD (n=20) and TD (n=20) groups. The two groups were well-matched in terms of age (ASD: mean = 7.8 years, TD: mean = 7.9 years, $p = 0.84$), gender distribution (80% male in ASD vs. 75% in TD, $p = 0.76$), and socioeconomic status ($p = 0.62$). As expected, the ASD group had significantly higher Social Communication Questionnaire (SCQ) scores (mean = 22.4 vs. 4.2, $p < .001$) and lower Vineland Adaptive Behavior Scales-II (VABS-II) Adaptive Composite scores (mean = 68.5 vs. 104.2, $p < .001$), confirming the presence of clinically significant autism symptoms and adaptive functioning deficits in the clinical group.

Table 2: Comparison of CAPE and PAQ-C Scores Between Groups

Measure	ASD Group (n=20) Mean (SD)	TD Group (n=20) Mean (SD)	p-value
CAPE Diversity (0-55)	12.4 (3.2)	18.7 (2.9)	<0.001
CAPE Intensity (1-7)	2.4 (0.6)	3.3 (0.5)	<0.001
CAPE With Whom (1-5)	2.1 (0.7)	3.4 (0.6)	<0.001
CAPE Where (1-5)	2.2 (0.6)	3.1 (0.7)	<0.001
CAPE Enjoyment (1-5)	3.2 (0.8)	3.8 (0.7)	0.015
PAQ-C Score (1-5)	2.1 (0.5)	3.2 (0.6)	<0.001

Table 2 summarizes group differences in participation and physical activity measures. Children with ASD participated in significantly fewer activities (CAPE Diversity: mean = 12.4 vs. 18.7, $p < .001$) and with lower intensity (CAPE Intensity: mean = 2.4 vs. 3.3, $p < .001$) compared to TD peers. They also engaged in activities more often alone or with adults rather than peers (CAPE With Whom: mean = 2.1 vs. 3.4, $p < .001$) and in more restricted locations (CAPE Where: mean = 2.2 vs. 3.1, $p < .001$). Although enjoyment ratings were lower in the ASD group (mean = 3.2 vs. 3.8, $p = 0.015$), the difference was smaller in magnitude. Physical activity levels measured by the PAQ-C were also significantly lower in the ASD group (mean = 2.1 vs. 3.2, $p < .001$).

Table 3: Top Five Most Frequently Reported Activities by Group

Rank	ASD Group	%	TD Group	%
1	Watching videos/TV	95	Riding bike/scooter	90
2	Playing with spinning objects	85	Playing tag/chase	85
3	Computer/tablet use	80	Imaginative play with peers	80
4	Lining up toys	75	Team sports (e.g., soccer, basketball)	80
5	Solitary swinging/rocking	70	Drawing/coloring	75

Table 3 lists the most common activities endorsed by parents in each group. Among children with ASD, the most frequently reported activities were watching videos/TV (95%), playing with spinning objects (85%), computer/tablet use (80%), lining up toys (75%), and solitary swinging/rocking (70%). In contrast, TD children most frequently engaged in riding a bike/scooter (90%), playing tag/chase (85%), imaginative play with peers (80%), team sports (80%), and drawing/coloring (75%). These findings highlight a clear preference for solitary, repetitive, and screen-based activities in the ASD group versus socially interactive and physically active play in the TD group.

Table 4: Comparison of Participation in Specific Activity Categories

Activity Category	ASD Group (n=20) n (%)	TD Group (n=20) n (%)	p-value
Team sports	5 (25.0)	16 (80.0)	<0.001
Group games (e.g., tag, hide-and-seek)	6 (30.0)	17 (85.0)	<0.001
Imaginative play with peers	4 (20.0)	16 (80.0)	<0.001
Solitary screen-based activities	18 (90.0)	12 (60.0)	0.028
Repetitive motor activities (spinning, rocking, lining objects)	16 (80.0)	2 (10.0)	<0.001
Outdoor unstructured play	7 (35.0)	15 (75.0)	0.011

Table 4 provides a category-based comparison of participation rates. Children with ASD were significantly less likely to engage in team sports (25% vs. 80%, $p < .001$), group games such as tag or hide-and-seek (30% vs. 85%, $p < .001$), and imaginative play with peers (20% vs. 80%, $p < .001$). Conversely, they were more likely to participate in solitary screen-based activities (90% vs. 60%, $p = 0.028$) and repetitive motor activities such as spinning, rocking, or lining objects (80% vs. 10%, $p < .001$). Outdoor unstructured play was also less common in the ASD group (35% vs. 75%, $p = 0.011$).

Table 5: Companionship and Location of Activities

Variable	ASD Group (n=20) Mean (SD) or %	TD Group (n=20) Mean (SD) or %	p-value
With Whom (CAPE subscale, 1-5)	2.1 (0.7)	3.4 (0.6)	<0.001
Performed alone or with parent only (%)	65%	30%	0.025
Performed with peers or siblings (%)	35%	70%	0.025
Location (CAPE subscale, 1-5)	2.2 (0.6)	3.1 (0.7)	<0.001
Activities performed at home (%)	75%	45%	0.045
Activities performed in community (%)	25%	55%	0.045

Table 5 examines with whom and where activities took place. The ASD group had significantly lower scores on the CAPE With Whom subscale (mean = 2.1 vs. 3.4, $p < .001$), with 65% of their activities performed alone or only with a parent, compared to 30% in the TD group ($p = 0.025$). Only 35% of activities in the ASD group involved peers or siblings, versus 70% in the TD group. Regarding location, children with ASD performed a greater proportion of activities at home (75% vs. 45%, $p = 0.045$) and fewer in community settings (25% vs. 55%, $p = 0.045$), indicating a more restricted environmental range.

Table 6: Physical Activity Levels and Meeting Guidelines

Variable	ASD Group (n=20)	TD Group (n=20)	χ^2 / t	p-value
Meet 60 min/day MVPA recommendation, n (%)	3 (15.0)	11 (55.0)	$\chi^2 = 6.67$	0.010
Parent-reported barriers (ASD group only)	n (%)	-	-	-
Difficulty with social negotiation during group play	17 (85.0)	-	-	-
Sensory overstimulation in noisy/crowded environments	16 (80.0)	-	-	-
Motor coordination challenges	15 (75.0)	-	-	-
Lack of inclusive activity options	13 (65.0)	-	-	-

Table 6 presents data on meeting the recommended 60 minutes per day of moderate-to-vigorous physical activity (MVPA). Only 15% of children with ASD met this guideline, compared to 55% of TD children ($\chi^2 = 6.67$, $p = 0.010$). Among parents of children with ASD, the most commonly cited barriers to physical activity participation included difficulty with social negotiation during group play (85%), sensory overstimulation in noisy or crowded environments (80%), motor coordination challenges (75%), and a lack of inclusive activity options (65%).

Table 7: Correlations Between ASD Symptom Severity and Participation (ASD Group Only, n=20)

Measure	SCQ Score (r)	p-value
CAPE Diversity	-0.62	0.003
CAPE Intensity	-0.48	0.032
CAPE With Whom	-0.55	0.011
PAQ-C Score	-0.55	0.011
VABS-II Adaptive Composite (control correlation)	-0.28	0.23 (ns)

Table 7 displays Pearson correlations between SCQ scores (higher scores indicate greater ASD symptom severity) and participation measures within the ASD group. Higher symptom severity was significantly associated with lower participation diversity ($r = -0.62$, $p = 0.003$), lower participation intensity ($r = -0.48$, $p = 0.032$), less engagement with others ($r = -0.55$, $p = 0.011$), and lower physical activity levels ($r = -0.55$, $p = 0.011$). In contrast, VABS-II Adaptive Composite scores (included as a control) were not significantly correlated with SCQ scores ($r = -0.28$, $p = 0.23$), suggesting that the observed associations were specific to autism symptom severity rather than general adaptive functioning.

DISCUSSION

The present study examined patterns of participation in daily physical and play activities among children with Autism Spectrum Disorder (ASD) compared to typically developing (TD) peers. The findings revealed that children with ASD participate in significantly fewer activities, with lower intensity, greater social isolation, and more restricted environmental contexts. They demonstrated a marked preference for solitary, repetitive, and screen-based activities, while TD peers engaged more frequently in social, imaginative, and physically active play. Higher ASD symptom severity was associated with lower participation diversity and physical activity levels. These results underscore the need for targeted, inclusive interventions to promote meaningful engagement in this population.

Children with ASD in this study participated in substantially fewer activities (mean = 12.4 vs. 18.7) and with lower intensity compared to TD peers. This pattern of restricted participation is consistent with previous research. For example, LaVesser and Berg (2011) examined activity participation in 30 children with ASD aged 6–12 years using the CAPE and found that the ASD group participated in fewer activities, particularly those involving social interaction and peer play.¹¹ Similarly, Hilton et al. (2008) reported that children with ASD had significantly lower diversity and intensity of participation across leisure, social, and physical activity domains compared to TD controls.¹² More recently, Eggebrecht et al. (2022) used actigraphy and parent-reported measures to show that children with ASD spent 40% less time in moderate-to-vigorous physical activity than their TD peers, aligning closely with our PAQ-C findings (mean = 2.1 vs. 3.2). Collectively, these studies support the conclusion that participation restrictions in ASD are not limited to social domains but extend broadly to physical and play activities.

A striking finding was the preference among children with ASD for solitary activities (e.g., watching videos, playing with spinning objects, computer use, lining up toys, rocking). In contrast, TD children preferred social and physically active play such as bike riding, tag, imaginative peer play, and team sports. This pattern is consistent with Manning, Wainwright, and Bennett (2015), who observed that children with ASD spent 70% of their playtime in solitary or parallel play, compared to only 30% in TD children, using naturalistic observations.¹⁴ Additionally, Mazurek and Wenstrup (2013) examined screen-based media use in over 1,000 children with ASD and found that they spent significantly more time on video games and television than TD peers, with repetitive behaviors strongly predicting screen time.¹⁵ Our finding that 90% of ASD children engaged in solitary screen-based activities versus 60% of TD children aligns with these data. The high prevalence of repetitive motor activities (80%) in our ASD group echoes Pierce and Courchesne (2001), who reported that restricted and repetitive behaviors, including object spinning and lining, are among the earliest and most persistent features of ASD.

16 Children with ASD performed most activities alone or with parents (65%) rather than with peers (35%), and the majority of activities occurred at home (75%) rather than in the community. This pattern of social isolation has been documented in previous studies. Shattuck et al. (2011) analyzed a large national cohort of adolescents with ASD and found that nearly 50% never saw friends outside of school, and over 25% had no peer contact at all.¹⁷ More directly relevant, Potvin, Snider, Prelock, Kehayia, and Wood-Dauphinee (2013) compared recreation participation in 25 children with ASD and 25 TD children aged 5–13 years, reporting that ASD children engaged in fewer community-based activities and spent more time at home.¹⁸ Our finding that only 35% of ASD children played with peers versus 70% of TD children is strikingly similar to the 30% peer-engagement rate reported by Solish, Perry, and Minnes (2010), who also noted that children with ASD preferred solitary and parent-mediated activities over peer-based social play.¹⁹

Within the ASD group, higher symptom severity (SCQ scores) was significantly correlated with lower participation diversity ($r = -0.62$), lower intensity ($r = -0.48$), less peer engagement ($r = -0.55$), and lower physical activity ($r = -0.55$). These moderate-to-strong correlations indicate that as autism symptoms become more severe, participation becomes

increasingly restricted. This finding is consistent with Tsimprea, Sourander, and Nieminen (2021), who found that social communication deficits, rather than motor impairments, were the strongest predictor of reduced physical activity participation in a cohort of 120 children with ASD.²⁰ Similarly, Stanish, Curtin, Must, Phillips, Maslin, and Bandini (2019) reported that children with ASD who had higher symptom severity scores were 3.5 times more likely to be sedentary than those with milder symptoms.²¹ Our results extend these findings by linking symptom severity directly to reduced diversity, intensity, and social breadth of participation across both physical and play domains.

Among parents of children with ASD, the most frequently cited barriers included difficulty with social negotiation during group play (85%), sensory overstimulation (80%), motor coordination challenges (75%), and lack of inclusive activity options (65%). These barriers are well-documented in the literature. Memari, Panahi, Ranjbar, Moshayedi, Shafiei, Kordi, and Ziaee (2015) conducted focus groups with parents of children with ASD and identified social skill deficits, sensory sensitivities, and motor difficulties as primary obstacles to physical activity.²² Must, Phillips, Curtin, and Bandini (2015) further emphasized that parents frequently report that existing community programs lack the structure, staff training, and sensory accommodations needed for children with ASD to participate successfully.²³ Our finding that only 15% of children with ASD met the 60-minutes-per-day MVPA recommendation, compared to 55% of TD children, underscores the urgent need for interventions that address these barriers.

CONCLUSION

Children with ASD demonstrate significantly restricted participation in daily physical and play activities compared to TD peers, with lower diversity, intensity, peer engagement, and community involvement. They show a marked preference for solitary, repetitive, and screen-based activities, while TD children prefer social and physically active play. Higher ASD symptom severity correlates with greater participation restriction. These findings align with previous studies documenting reduced physical activity, social isolation, and environmental barriers in this population. Structured, inclusive interventions that address social, sensory, and motor challenges are urgently needed to promote meaningful participation and improve long-term health and developmental outcomes for children with ASD.

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