

Motor Play Matters! Facilitating Motor Skills and Executive Functioning for Children with Autism



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Introduction

Autism is a lifelong neurodevelopmental condition characterized by difficulty with social communication and the presence of highly restrictive, repetitive behaviors. Although motor skills are not considered a core feature in the diagnosis of autism, recent evidence suggests that 73–88% of autistic children performed below-age motor function (Ruggeri et al., 2019), including poorer motor coordination and slower running speed, decreased muscle strength, decreased ability in jumping, throwing, striking, catching, dribbling, and kicking (Odeh et al., 2022).

Motor skills mediate the relation between communication and social skills, adaptive behavior, and executive functioning. Without a structured environment and direct instruction, majority of autistic children are not able to access and participate in physical activity to learn and practice motor skills Limited participation in physical activity leads to inactive lifestyles and further depriving them of important developmental experiences to support their health and wellbeing. The purpose of this study was to examine the effectiveness of the structured motor program on motor, social communication, adaptive behavior, and executive functioning for the children (aged 9 and under) with autism.

Research Questions (RQ)

RQ1: To what extent did the CHAMP-A program increase motor skills, social and communication skills, adaptive behavior, and executive functioning?
RQ2: To what extent was the CHAMP-A program feasible with respect to attendance, attrition, fidelity, and acceptability?

Methods

Outcome Measures

Prior to CHAMP-A summer camp, parents of children participants completed:

1. demographic questionnaires,
2. pre-surveys including The Social Responsiveness Scale-2nd Edition (SRS; social communication skills), the Vineland Adaptive Behavior Scale (VABS-3, adaptive behavior), and the Short Sensory Profile-2 (SSP-2; sensory needs) , and interviews to understand their child’s unique needs and provide adaptations;

Children participants participated:

1. The Bruininks-Oseretsky Test of Gross Motor Proficiency, Third Edition (BOT-3; Motor skills)
2. The Nonverbal Stroop Card Sorting Test (NSCST; executive functioning)

After 12 CHAMP-A sessions were completed, parents of children participants were asked to complete (1) post-surveys (i.e., SRS and VABS-3) and (2) post-interview to explore the feasibility and acceptability of the CHAMPPS-A summer camp. Children participants completed the post-tests (i.e., BOT-3 and NSCST), which were the same as the pre-tests.

CHAMP-A Program

CHAMP-A program adapt an existing structured motor program for children with disabilities: Children in Action: Motor Program for Preschoolers; CHAMPPS(Ostrosky et al., 2024). CHAMPPS is a seven-unit curriculum. The seven units reflect on foundational motor skills (Unit 1: body awareness, motor imitation, and visual tracking) and fundamental motor skills (Unit 2: walking/running; unit 3: balance/jumping; unit 4: catching; unit 5: throwing; unit 6: striking; and unit 7: kicking) through motor play activities and music videos (see Table 1 for the format of each lesson). This preliminary study of adapting CHAMPPS to meet the unique needs of children with autism (CHAMP-A) was conducted as a summer camp format between July 16 and August 8th in 2024 and consisted of 16 hours of motor activities (i.e., 80 mins per session, one session a day, three days a week for four weeks at the two multipurpose rooms of Northern Illinois University Health, Wellness, and Literacy Center.

Time	Activity	Structure
5 min	Warm- Up	Whole group
10 min	Core 1: Roll & Catch	Partners
10 min	Core 2: Throw & Catch	Partners
10 mins	Physical Activity: Music Video	Whole group
5 mins	Cool Down	Whole group



Participants

Inclusion criteria: children needed to: (1) have a diagnosis of autism, (2) between the age of 3 and 9 years because significant correlation is demonstrated between motor and social communication for autistic children who are under 9 years old, and (3) be able to follow one step direction to participate in the motor skills assessment. Participants will not be required to stop any medications that they may be receiving but details of medication use will be reported.

Exclusion criteria: children who are (1) non-ambulatory, (2) unable to follow one-step instruction, (3) having comorbid diagnosis such as Cerebral Palsy, or Spina Bifida, or epilepsy requiring medication, (4) having cognitive ability (IQ) below 70, (5) participating in any other structured motor program throughout the duration of the intervention, (6) enrolled in a range of services including physical therapy, speech therapy, and occupational therapy throughout the duration of the intervention were not included in this study. Additionally, children who were missing five or more days of the intervention were not included in this data analysis.

Child gender	Child age (year)	Race or Ethnicity	Child disability	Services received
Male	6	White	ASD; suspected ADHD & giftedness; photographic memory	OT and ST through school (public school)
Female	4	Hispanic/Latino	ASD; ADD/ADHD	ST
Male	4	Hispanic/Latino	ASD; Hypermobility Syndrome	ST; PT; OT during the school
Nonbinary	9	Hispanic/white	ASD	
Female	6	White/AA	ASD; ADHD (not diagnosed)	Psychiatric services for anxiety
Male	6	White	ASD; Intellectual Disability; learning disability	None

Results

Motor skills: autistic children participants perform statistically significantly higher in BOT-3 overall scores (t = -4.149, p = .025, d=-2.075) with large effect sizes.

Adaptive Behaviors Skills: Significant improvements were observed in communication (t=3.068; p=.028; d=1.25), daily living skills (t = 2.682; p = .044; d =1.10), Additionally, there is a statistically significant reduction in problem behavior (t= 2.619; p= .047; d= 1.069)with large effect size.

Social Skills and Executive functioning: no statistically significant difference between pretest and posttest. **Fidelity of implementation** was 100%.

Feasibility: All parents reported high satisfaction with the CHAMP-A program.

- The time frame from 3:00 - 4:30 pm Tuesdays to Thursdays was feasible and the 75-minute duration for each session was acceptable for participants.
- There was no participant dropouts after treatment had started.



Discussion

Improved Motor Skills: The CHAMP-A program significantly increased motor skills, particularly bilateral coordination. These findings align with previous research showing that children with autism struggle with coordinating movements, impacting their ability to engage in physical and social activities. Motor impairments in autistic children can affect social skills, adaptive functions, and participation in school life.

Reduction in Problem Behaviors: Participants showed a statistically significant decrease in problem behaviors after completing the program. Structured physical activity programs can improve motor coordination and self-regulation, which may help reduce maladaptive behaviors such as aggression and self-injury. Research supports the link between motor difficulties and behavioral issues, emphasizing the importance of motor-based interventions.

Feasibility and Caregiver Satisfaction: The CHAMP-A summer camp format was well-received by both caregivers and children, with high attendance, no dropouts, and positive feedback. Parents suggested extending session duration, but the current 75-minute length already exceeds typical structured motor programs. Future studies should explore whether longer sessions remain feasible for families with autistic children, who often face scheduling barriers.



References

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