

# Alterations in Musculoskeletal Function and Body Composition in Children with Autism Spectrum Disorder

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## Abstract

**Introduction:** Autism Spectrum Disorder (ASD) is a behaviorally defined neurological disorder characterized by impaired social interaction and atypical behaviors. Children with ASD appear to have weaker muscular function and low bone mineral density. Recent studies indicate that adolescents with ASD develop obesity and bone fracture incidence at a higher rate compared to typically developing peers. Limited information is available to identify levels of obesity and its relation to muscular function and bone composition in children with ASD. **Purpose:** To determine whether differential body composition may affect muscular function and strength in children with ASD. **Methods:** Total of 32 typically developing children (TDC) and children with ASD participated in the study. Muscular strength (i.e., torque, work, and power) during knee extension and flexion was measured at 90, 150, and 210 °/sec using Humac Norm Isokinetic Dynamometer. Maximal isometric forearm muscular strength was measured using a handgrip dynamometer. Body mass index (BMI), waist-to-hip ratio, and whole-body scan from Dual Energy X-Ray Absorptiometry were used to identify the levels of obesity and bone density. **Results:** Both TDC and ASD groups had similar total body mass and BMI. However, ASD children had significantly lower percent bone mass with higher body fat, waist-to-hip ratio and waist circumference. The relative maximal forearm and leg strength was significantly lower in ASD compared to TDC. There was a significant inverse relationship with forearm (and leg) strength and regional percent fat in the arm (and leg, respectively). **Conclusion:** These findings suggest that body composition appeared to influence muscular strength in children with ASD. Less fat in the regions rather than the total body mass may contribute for higher leg or forearm muscular strength in children with ASD.

## Methods

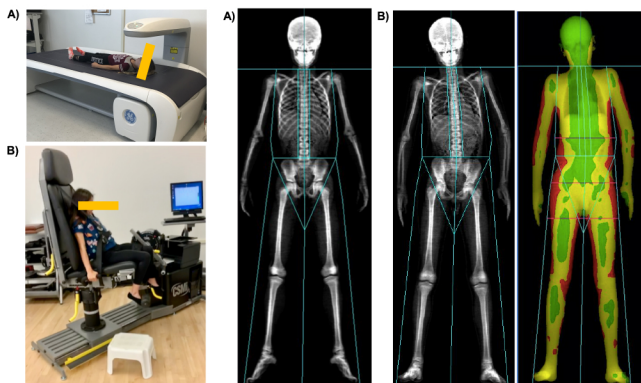


Figure 1. Experimental set-up using Dual Energy X-ray Absorptiometry (DXA, panel A) and Humac Norm Isokinetic Dynamometer (panel B)

Figure 2. Body composition analysis using Dual Energy X-ray Absorptiometry (DXA) in TDC (panel A) and Autism Spectrum Disorder (ASD, panel B) participants

## Research Questions

1. Will the gaining of muscles support healthy development in children with ASD?
2. Will exercise training reduce body fat in children with ASD?
3. Will exercise training gain muscular strength and bone density of children with ASD?
4. Will exercise training help ASD population to reduce fall and fracture incidents?

## Findings

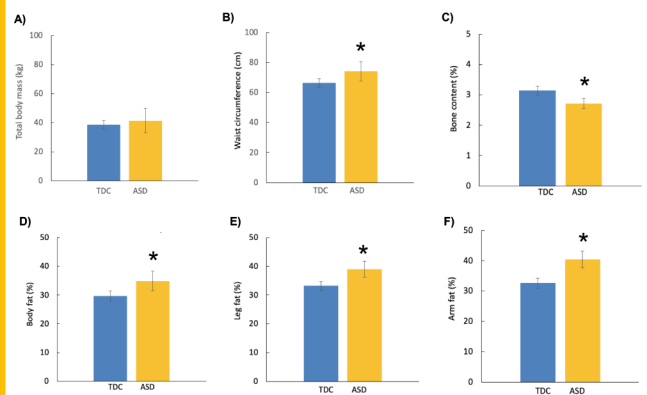


Figure 3. Summary data showing group differences in body composition, such as total body mass (panel A), waist circumference (panel B), bone content (panel C), total percent body fat (panel D), regional leg fat (panel E) and, regional arm fat (panel F) in control (TDC) and Autism Spectrum Disorder (ASD) groups. \* represent P<0.05 vs. TDC.

## Findings

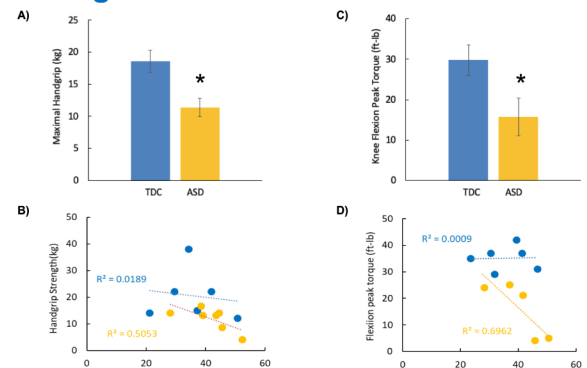


Figure 4. Summary data showing group differences in maximal handgrip strength (panel A) and knee flexion peak torque (panel C), and the relationships between handgrip muscular strength and percent fat in the arm (panel B), and between knee flexor peak torque and percent body fat in the leg (panel D) in control (TDC) and Autism Spectrum Disorder (ASD) participants. \* represent P<0.05 vs. TDC.

## Citations

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