Beyond Body Mass Index: Examining Physical Health Indicators Among Preschoolers With and Without Attention-Deficit/Hyperactivity Disorder

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BACKGROUND

- Obesity in children has been on an upward trend for the past 14 years (Skinner & Skelton, 2014).
- The prevalence of childhood obesity creates a need for understanding this trend and finding solutions to mitigate the current epidemic (Ogden et al., 2016).
- Research indicates that there is an association between obesity and Attention-Deficit/Hyperactivity Disorder (ADHD); however, there is a lack of research examining how such association emerges in early childhood (Cortese & Vincenzi, 2011).
- More importantly, there is a lack of work on examining a wider range of early health indicators (e.g., physical activity, fitness, nutrition, fat adiposity) among children with ADHD relative to typically developing (TD) children.

RESEACH QUESTIONS

1) Are there differences in body composition, beyond BMI, between young children with and without ADHD?
2) Are there differences in other health-related metrics (i.e., physical activity, fitness, and nutrition) between young children with and without ADHD? How do changes in physical health metrics vary between those with and without ADHD after 1 year?

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METHOD

Participants

•195 children (66.2% boys; Mean age = 5.47 yrs. *SD* = .76 yrs.)
•**Ethnicity:** 93.3 % White, 6.7% Black/African-American, 2.1% American Indian/Alaska Native, 83.1% Hispanic/Latino
•**Language:** 40% English only, 3.6% Spanish only, 55.9% English and Spanish
•**Diagnosis**: 103 children with ADHD (52.8%), 95 children that are TD (47.2%)

Measures

Anthropometrics

- Children's height was to the nearest .01 cm using a wall-mounted stadiometer (Seca, Columbia, MD).
- Mediana i35 Body Composition Analyzer provided information regarding their overall weight (to the nearest .01 kg) and body composition (i.e., body fat percentage) via bioelectric impedance analysis (BIA).
- BMI, BMI percentile, and BMI z-score were calculated based on age and sex norms from the Center for Disease Control and Prevention (CDC) and National Center for Health Statistics (2004). Participants' BMI was categorized based on CDC guidelines.

Physical Activity & Fitness

- Physical activity (PA) was measured using the triaxial accelerometer (Respironics Actical) and calibrated to the child's height and weight
- Participants were instructed to wear the device on a belt at the waist for seven days.
- Steps, energy exerted, % of the day spent in sedentary PA, and % of the day spent in moderate to vigorous physical activity (MVPA) were averaged across valid days of wear for each participant.
- Children completed a side-to-side jump test as part of the Karlsruhe motor screening test battery (Bös et al., 2004). The number of side jumps in the 30-second period was used as a measurement of fitness.

Nutrition

- Caregivers completed three separate daily food recalls for their child. Food recalls were inputted into the Automated Self-Administered 24-hour (ASA24®) Dietary Assessment Tool where nutritional profiles were calculated.
- Nutritional profiles and recalls were used to calculate average daily caloric intake (kcals) and a healthy eating index (HEI).
- The HEI calculates proximity to meeting the Dietary Guidelines for Americans 2020-2025 (USDA, 2020). Scores closer to 100 = greater adherence to the guidelines. HEI was used to analyze dietary quality whereas caloric intake was used to analyze dietary quantity (Krebs-Smith et al., 2018).

RESULTS

Table 1. Differences in Physical Health Metrics Between Diagnostic Groups across Time

Variable	ADHD vs. TD		
Anthropometrics	Baseline	1 Year	F
BMI	0.64*	0.40	1.23
BMI z-score	0.38**	0.20	2.63
% body fat	1.34	0.86	0.24
Physical Activity			
Side Jumps	-4.03***	-1.95	2.26
Steps	216.22	-230.24	1.04
EE	17.49	16.40	0.01
% sedentary PA	-0.66	4.08*	7.68**
% MVPA	0.45	0.04	0.67
Nutrition			
HEI	-3.05*	-0.27	2.85
Calories	115.86**	-49.86	9.69**

* $p < .05$. ** $p < .01$, *** $p < .001$. All analyses controlled for age and sex. 1 Year = 1 Year follow-up timepoint.

Figure 1. Differences in Proportion of Overweight/Obese BMI by Diagnostic Status

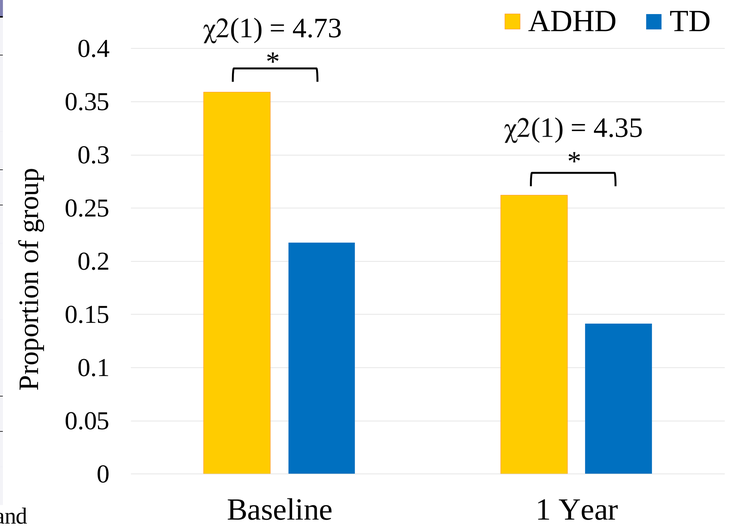
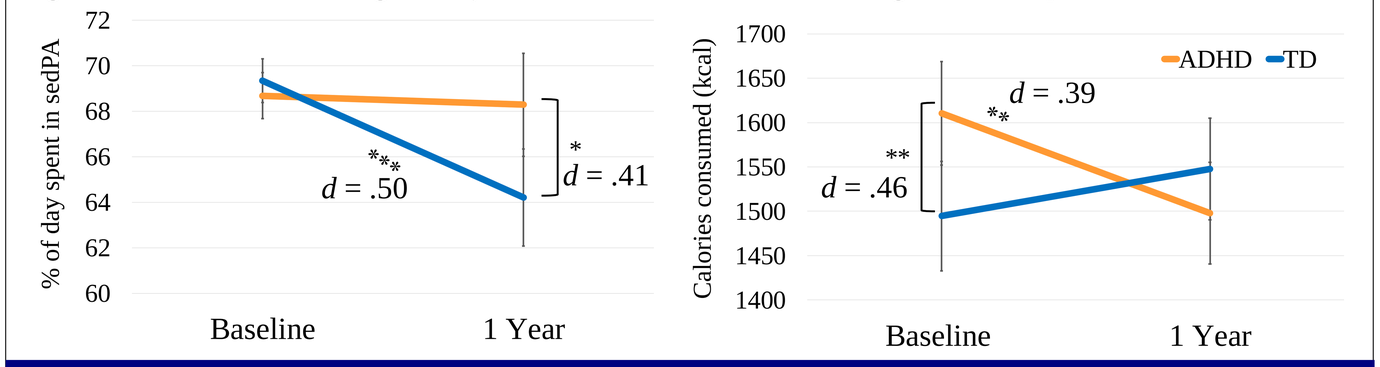


Figure 2. Differences in Change in Physical Health Metrices between Diagnostic Groups



DISCUSSION & IMPLICATIONS

- This study adds to the growing literature documenting that children with ADHD may be at greater risk for developing obesity. Our study is novel in that we evaluate a variety of physical health metrics, beyond BMI, such as physical activity, fitness, nutrition, and percentage body fat in a primarily Hispanic/Latinx sample. We found significant differences in fitness, BMI, and calorie consumption. These significant differences did not remain after 1 year. However, children with ADHD were still proportionally more likely to be in the overweight/obese category relative to TD children one year later.
- TD children significantly decreased their percentage of the day spent in sedentary physical activity compared to children with ADHD who remained stable in their sedentary physical activity.
- Future research should examine additional timepoints to evaluate a more comprehensive growth trajectory of body composition and health-related metrics. Inventions targeting ADHD ought to incorporate improving physical health behaviors to reduce risk for obesity and lifestyle-related diseases.