Cumulative accelerometer-based light physical activity from childhood through young adulthood progressively decreases left ventricular mass in British youth: a 13-year longitudinal study

A.O. Agbaje

1University of Eastern Finland, Institute of Public Health and Clinical Nutrition, School of Medicine, Faculty of Health Sciences, Kuopio, Finland

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Background: Several studies have reported the beneficial effect of moderate to vigorous physical activity on metabolic indices in children and adolescents. However, longitudinal evidence is lacking on the effect of objectively measured light physical activity on cardiac health in the pediatric population. An increased ventricular mass has been associated with cardiovascular events in adults.

Purpose: To investigate the longitudinal association of cumulative light physical activity from childhood through young adulthood with cardiac structural changes.

Methods: From the Avon Longitudinal Study of Parents and Children (ALSPAC), UK birth cohort, 766 children aged 11 years who had at least two follow-up time-points accelerometer-measured light physical activity over 13 years follow-up, and complete cardiac structural measures at age 17 years clinic visit were included. Light physical activity was assessed with ActiGraph accelerometer worn for 4–7 days at the 11-, 15-, and 24-year clinic visits. Repeated echocardiography measured left ventricular mass indexed for height$^2.7$ (LVMI$_{2.7}$) and relative wall thickness (RWT) were available at baseline and follow-up. Multivariable adjusted associations were examined using generalized linear mixed-effect models and adjusted for sex, and time-varying covariates measured at both baseline and follow-up such as age, insulin, high-sensitivity C-reactive protein, heart rate, systolic blood pressure, glucose, fat mass, lean mass, smoking status, family history of hypertension/diabetes/high cholesterol/vascular disease, socioeconomic status, triglyceride, low-density lipoprotein cholesterol, high-density lipoprotein cholesterol, sedentary time, and moderate to vigorous physical activity.

Results: Among 766 children (mean [SD] age, 11.75 [0.24] years; 422 [55.0%] females) males spent on average 373, 288, and 146 minutes/day in light physical activity at ages 11, 15, and 24 years, respectively. Females spent an average of 373, 272, and 161 minutes/day in light physical activity at ages 11, 15, and 24 years respectively. LVMI$_{2.7}$ was significantly higher among males than females with an average difference of ~4g/m$^2.7$ both at ages 17 and 24 years but no significant sex differences in RWT. In a fully adjusted model, every 1-minute spent in light physical activity from ages 11 – 24 years was associated with progressively decreased changes in LVMI$_{2.7}$ (effect estimate -0.017g/m$^2.7$ [CI -0.020 – -0.015] p<0.0001), and increased RWT from ages 17 – 24 years in the total cohort. Among males, each minute spent in light physical activity from ages 11 – 24 years was associated with progressively decreased changes in LVMI$_{2.7}$ (-0.046g/m$^2.7$ [CI -0.050 – -0.041] p<0.0001) and increased RWT but not in females.

Conclusion: Cumulative light physical activity during growth from childhood through young adulthood was associated with a progressive decrease in cardiac mass in the total cohort and males.