An average of 60mins/day of moderate to vigorous physical activity from childhood through young adulthood was associated with worsening cardiac structural damage in youth: A 13-year longitudinal study

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Background: Health guidelines have recommended that children and adolescents engage in moderate to vigorous physical activity (MVPA) of $\geq$60mins/day. However, there is no longitudinal evidence on the effect of $\geq$60mins/day of MVPA on cardiac health in the pediatric population.

Purpose: To investigate the longitudinal association of cumulative MVPA 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. MVPA was assessed with ActiGraph accelerometer worn for 4-7 days at the 11-, 15-, and 24-year clinic visits. Moderate to vigorous physical activity was categorized as $<40$ mins/day (reference), $40-<60$mins/day, and $\geq 60$mins/day. Echocardiography assessed left ventricular mass indexed for height$^2.7$ (LVMI$^{2.7}$) and relative wall thickness (RWT) at baseline and follow-up. 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 light PA.

Results: Among 766 children (mean [SD] age, 11.75 [0.24] years; 422 [55.0%] females) males spent on average 64, 56, and 55mins/day in MVPA at ages 11, 15, and 24 years, respectively. Females spent an average of 47, 39, and 47mins/day in MVPA at ages 11, 15, and 24 years respectively. LVMI$^{2.7}$ was significantly higher among males than females with an average difference of $\sim 4g/m^2.7$ both at ages 17 and 24 years but no significant sex differences in RWT. In a fully adjusted model, persistent $\geq 60$min/day of MVPA from ages 11–24 years was associated with higher LVMI$^{2.7}$ (effect estimate $0.856g/m^2.7$ [CI 0.346 – 1.367] $p=0.001$) and higher RWT (0.013g/m$^2.7$ [CI 0.010 – 0.017] $p=0.003$) at age 24 years in the total cohort. Each minute spent in MVPA from ages 11–24 years was associated with progressively increased changes in LVMI$^{2.7}$ ($0.010g/m^2.7$ [CI 0.002 – 0.019] $p=0.016$) but not increased RWT from ages 17–24 years. Each minute spent in MVPA from ages 11–24 years was associated with progressively increased changes in LVMI$^{2.7}$ ($0.049g/m^2.7$ [CI 0.037 – 0.061] $p<0.0001$) in males but not in females and increased RWT from ages 17–24 years in both males and females.

Conclusion: Persistent $\geq 60$min/day of MVPA and each minute spent in MVPA during growth from childhood through young adulthood was associated with progressive ventricular concentric remodelling.