POSTER: RHYTHMIC TIMING CONTROL DURING TWO-LEGGED HOPPING IN CHILDREN WITH AND WITHOUT DOWN SYNDROME

* Jianhua Wu 1 and Matthew Beerse 2

1 Georgia State University, Kinesiology and Health, Atlanta, GA, USA. jwu11@gsu.edu;
2 University of Dayton, Health and Sport Science, Dayton, OH, USA.https://citadelonline.zoom.us/j/4429956833

Objective: We aim to understand the developmental trajectory of timing and force control during two-legged hopping in typically developing (TD) children and children with Down syndrome (DS). Method: Nine children with DS (6F/3M) aged 7-11 years and nine sex- and age-matched TD children participated in this study. Kinetic data were captured using an AMTI force plate and sampling at 1000 Hz. Subjects hopped on two legs at three metronome-cued conditions in a random order: (a) preferred; (b) 20% decreased from preferred (slow); and (c) 20% increased from preferred (moderate). Subjects completed three 20-second trials for each condition. Dependent variables included cycle time, stance time, flight time, time to peak vertical ground reaction force (vGRF), time from peak vGRF to takeoff, peak vGRF, and rate of force development (RFD) from foot-strike to peak vGRF. We calculated coefficient of variation (CV) across hopping cycles. We also used the Ljung-Box statistic for lag 1 autocorrelation to assess rhythm control. Results: In contrast to adults, both groups restructured their stance and flight time as a percentage of cycle time. No force-time parameters showed a significant negative lag 1 autocorrelation, suggesting that both groups did not use RFD as a dynamic systems timer. Further, CV of cycle timing parameters did not illustrate a minimum at the preferred rate of movement, as found in adults. CV of force timing variability decreased in both groups as cued frequency increased, providing flexibility to the motor system when attempting to match a cued frequency. Children with DS demonstrated further delays compared to their TD peers in rhythmic control. Implications: Both children with and without DS aged 7-11 years are still developing a stable preferred rate of movement for continuous whole-body motor tasks such as two-legged hopping in-place. The interaction between rhythm and force timing control may
provide a theoretical framework for designing physical interventions, particularly for children with disabilities.