Relation of 24-hour Movement Patterns with Type 2 Diabetes Risk in Adults with Obesity

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Low moderate to vigorous physical activity (MVPA), increased sedentary behavior (SB), and poor sleep are each linked to insulin resistance and type 2 diabetes (T2D) risk. However, it is unclear what effect the aggregate of these movement patterns has on health. **PURPOSE:** To assess a healthy 24-hour movement pattern of MVPA, SB, and sleep in association with T2D risk in individuals with obesity. **METHODS:** In a cross-sectional study, individuals with obesity (n=58, 43F; 56.03±8.37y; 34.92±5.35kg/m^2) who had a healthy 24-hour movement Z-score (i.e., low values; n=29, 23F) were compared to those with unhealthy Z-scores (i.e., higher values; n=29, 20F). MVPA and SB were recorded over a 7-d period via waist-worn triaxial actigraphy. Sleep was assessed via the Pittsburgh Sleep Quality Index (PSQI). The Canadian Society for Exercise Physiology 24-hour movement guidelines were used to define a Z-score of MVPA as ≥30 min/d (≥2.94% of awake time), SB as ≤8 hours/d (≤47% of awake time), and sleep time as ≥7 hours. A 120min hyperinsulinemic-euglycemic clamp (40mU/m^2/min, 90 mg/dl) with indirect calorimetry was used to determine metabolic insulin sensitivity (glucose infusion rate (GIR)), fat (FOX) and carbohydrate (CHOox) oxidation, as well as non-oxidative glucose disposal (NOGD; GIR–CHOox). Fitness (VO$_2$max) and body fat (DXA) were also assessed. **RESULTS:** There were no differences in age (P=0.69), percent body fat (P=0.20), or VO$_2$max (P=0.39) between groups. Compared to healthy 24-hour patterns, however, unhealthy 24-hour patterns had higher FOX at 0min and 120min of the clamp (both $P<0.01$) as well as NOGD (P=0.02), despite similar GIR (P=0.53). Z-scores associated with high FOX at 0min (r=0.64, $P<0.01$) and 120min (r=0.63, $P<0.01$) and NOGD (r=0.43, $P<0.01$). **CONCLUSION:** In individuals with obesity, an unhealthy 24-hour movement pattern had no effect on insulin sensitivity, but related to high FOX and non-oxidative glucose disposal, independent of body fat and fitness. More work is needed to understand how habitual movement patterns modulate chronic disease risk. **SIGNIFICANCE/NOVELTY:** While physical activity, sedentary behavior, and sleep are each indicated for their importance in type 2 diabetes risk, understanding the impact of a 24-hour movement pattern is less clear. These findings highlight the relation of 24-hour movement patterns to fat oxidation and glucose storage independent of insulin sensitivity, body fat, and aerobic fitness.