

## **Comparing the Effects of Traditional Physical Activity and Active Video Gaming on Children's Cognition**

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### **ABSTRACT**

While the beneficial effects of physical activity on cognition are well studied, there is less certainty about how to incorporate cognition-boosting physical activity programs in children's academic settings. Multiple modalities may be implemented to get children moving, yet more clarity is needed to make these programs as effective as possible. **PURPOSE:** The purpose of this study was to compare the effects of traditional teacher-led physical activity (TPA) and active video gaming (AVG) on various measures of executive function to gain applicable knowledge that informs school physical activity programs. **METHODS:** Using a counterbalanced design, 36 preadolescent children (24 male, 10.17±1.59 years old) participated in 20 minutes of TPA (teacher-led aerobic dance and calisthenics) and 20 minutes of AVG (Xbox 360 Kinect Dance Central and adventure games) over a 2-day period. Stroop and Trail Making Tests (TMT) were used to assess inhibitory control and cognitive flexibility at baseline and post-intervention. Actigraph GT3X and Polar heart rate monitors were used to estimate energy expenditure. A paired-sample *t*-test was used to analyze the difference in caloric consumption between interventional modalities. Repeated measures ANOVA with Bonferroni post-hoc analysis were used to analyze differences between baseline and post intervention testing for Stroop (word, color, and color-word conditions), Stroop interference score, and to compare the difference in performance of TMT (TMT-A and TMT-B conditions) between interventional sessions. **RESULTS:** TPA had a higher caloric consumption and step count per minute than AVG ( $p < 0.01$ ). Compared to baseline, there was a significant improvement in accuracy on the Stroop Test for both intervention modalities ( $p < 0.001$ ), although there was no difference between intervention groups. There was also no significant difference in interference score between baseline and post interventions. For the TMT, we found an interaction between intervention and TMT condition ( $p < .01$ ). Pairwise comparisons revealed that TPA induced a faster reaction time than AVG for the more difficult TMT condition (TMT-B;  $p < .01$ ), but there was no significant difference in reaction time for the easy TMT condition (TMT-A) between intervention modalities. **CONCLUSION:** Participating in physical activity, regardless of modality, improves inhibitory control as reflected by the increased behavioral accuracy in all conditions of the Stroop test, but not conflict processing as measured by the Stroop interference score. Cognitive flexibility, as measured by the Trail Making Test, is best enhanced by traditional physical activity compared to active video gaming, but only when the behavioral task is difficult. TPA also resulted in a higher caloric expenditure than AVG.