Adapting Sedentary Video Games to Require Physical Activity

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Approximately $117 billion in annual healthcare costs are associated with physical inactivity. The Pew Research Center reports that about 49% of American adults play video games (VG). Adapting tradionally sedentaty VG controls to require physical activity using low coat devices may help to increase habitual physical activity.   **PURPOSE**: To determine the effects of adapting sedentary VG to require physical activity on exercise intensity, perceived exertion, enjoyment, and VG performance. **METHODS**: Three women and five men 22 to 53 years of age played PAC-MAN Championship Edition DX+ (NAMCO) in three conditions: sedentary play (SED), standing active play using gestures recognized by a motion sensor (AVG-G), and standing active play using buttons (AVG-B). Exercise intensity was assessed by recording continuous heart rate through a chest strap monitor. Ratings of perceived exertion (RPE) were reported using the Borg 6 to 20 scale. Enjoyment was reported by completing an abbreviated Physical Activity Enjoyment Scale. VG performance was represented by the in-game score. A repeated measures ANOVA was used to compare heart rate, RPE and enjoyment across conditions. A Friedman's ANOVA was used to compare VG performance scores across conditions. **RESULTS**: There was a significant effect of game condition on heart rate, percent of age predicted heart rate maximum (APHRM), and RPE ($p < 0.001$). Enjoyment was not significantly different across conditions ($p = 0.585$). Post hoc analysis indicated AVG-G and AVG-B elicited a higher mean (±SD) heart rate (112±15 and 102±15 BPM), percent of APHRM (61±8 and 55±9%), and RPE (12.58±2.04 and 11.45±2.31) versus SED (74±13 BPM, 40±8% APHRM, 7.07±1.06). VG performance was significantly different between game conditions, ($\chi^2 = 12.25$, $p = 0.002$) with lower scores in both AVG-G and AVG-B versus SED ($Z = -2.51$, $p = 0.012$). **CONCLUSIONS**: These results suggest that adapting sedentary video games to be active may positively impact health. Participants achieved moderate to vigorous physical activity during adapted AVG play. Enjoyment did not suffer as a result of active play despite lower VG performance.