Impact of Exergaming on Children’s Fundamental Motor Skills and Fitness

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ABSTRACT

PURPOSE: To determine the effectiveness of exergaming on children’s fundamental motor skills (FMS) and health-related fitness (HRF) compared to physical education (PE).

METHODS: A total of 261 (127 boys, 134 girls) second and third grade children from two urban elementary schools participated in the study. Children were assigned to one of two groups with the school as the experimental unit: (a) intervention (125-minute of alternating PE and exergaming program); or (b) control (125-minute weekly PE).

Instrumentation: FMS tests comprised of skills of kicking, throwing, long jump and hop. Maximum ball speeds were measured using a radar gun for kicking and throwing, and maximum long jump distance/height and hop distance was measured for the other two skills. For HRF, Progressive Aerobic Cardiovascular Endurance Run (PACER) was measured as the index for cardiorespiratory fitness, and grip strength, push-ups (upper body strength) and curl-ups (abdominal strength) were assessed as indices for musculoskeletal fitness using FITNESSGRAM protocols. Grip strength was included as a measure of total body strength. All these tests were previously validated and proven to be reliable measures.

Procedures: Children completed a warm-up routine before testing and had 3-5 practice trials before each motor skill test. Children were instructed to perform as hard or as fast as they could do and received feedback on each trial. Fitness tests were done in groups of two or three and instructed to demonstrate correct technique on curl-ups and pushups. In general, children completed the fitness and motor skill tests during three testing sessions. Baseline tests were measured in 2012 and post-tests were assessed in 2013.

RESULTS: There were significant interaction effects for cardiorespiratory fitness, F (1, 219) = 3.92, p < .05 and musculoskeletal fitness, F (1, 219) = 15.66, p < .01, but not FMS. Specifically, comparison children displayed significantly higher cardiorespiratory fitness score than intervention children at the baseline, but their fitness decreased at post-test while intervention children’s score increased. Further, comparison children’s muscle strength decreased (50.51/49.70) while intervention children’s increased (48.89/51.08) over time. FMS increased over time for both the intervention and control children.

CONCLUSIONS: Findings suggest that an exergaming program could have positive effects on children’s FMS and HRF.

INTRODUCTION

Evidence suggests that children’s proficiency in fundamental motor skills predict cardiorespiratory fitness, indicating children with good motor skills are more likely to become more fit. Thus development of children’s motor skill might be important component in designing intervention aiming to promote physical activity (PA) and fitness. In an effort to alleviate pediatric obesity, exergaming has been integrated into school-based PA programs to promote children’s PA. As research suggests that FMS and HRF are independently associated with children’s PA, it is important to understand whether a school-based exergaming program could help children develop FMS and HRF over time compared to PE. Thus, this quasi-experimental study was designed to determine the effectiveness of exergaming on children’s FMS and HRF as compared to PE.

METHODS

Participants and Settings: Participants were 261 second and third grade children (127 boys, 134 girls) from two public elementary schools in Texas. Children were in school that was either: (a) intervention (125-minute of alternating PE and exergaming program); or (b) control (125-minute weekly PE).

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Data Analysis: All tests were standardized and converted to T-scores. To analyze the effect of exergaming program on FMS and HRF, multivariate analysis of variance (MANOVA) with repeated measures was performed. The significance level was set at .05.

RESULTS

Figure 1 Cardiorespiratory Fitness between Groups

Cardiorespiratory Fitness

Exergaming

Comparison

PACER-pre

PACER-post

Figure 2 Musculoskeletal Fitness between Groups

Muscular Strength

Exergaming

Comparison

Figure 3 Fundamental Motor Skills between Groups

Fundamental Motor Skills

Exergaming

Comparison

DISCUSSIONS

The results revealed that intervention children’s HRF increased while that of the control group decreased. Moreover, intervention children demonstrated greater improvement in FMS compared to the control group. Although activities outside school could not be controlled for, our findings suggest that the addition of an exergaming program to PE may have led to positive effects on children’s FMS and HRF, as compared to decreased HRF and lesser improvement in FMS in the control group. These data indicate exergaming program can be an effective school-based program to supplement PE, as it is perceived as fun and enjoyable. We speculate that the fun component of exergaming spilled over to other realms of children’s life, resulting in more PA levels which may have led to improvement in motor skills and fitness.