Effectiveness of virtual reality and aerobic exercises in obese children. A Mini-Review

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ABSTRACT

Obesity, particularly in childhood, is considered a great problem around the world, especially in developed countries. This phenomenon should attract the attention of investigators to search for the actual causes of problem exaggeration and to find strategies to stop its prevalence. The nature and style of modern life and the distribution of fast meals rich in fats and oils are considered responsible factors leading to obesity in young adolescents. Active video games (AVG) can even be considered as a prospective alternative to traditional exercise for enhancing health status during childhood. Over the last decade, virtual reality (VR) exercises have gained much interest in the field of rehabilitation therapy. Several health benefits and favorable clinical outcomes have been reported in different populations following VR-based exercise programs. VR can be a very helpful tool for the treatment of childhood obesity and it can play a unique role in the rehabilitation of obese children based on body composition and quality of life effects reported in several studies. VR is considered a pleasure tool to overcome both overweight and sedentariness in infants. Recently, a team of multi-interested researchers, including physiotherapists, psychologists, engineers, and pediatricians, has worked to judge this advanced technology. But, whether VR exercises have advantages that could be superior to traditional exercise has been a question raised by several researchers. In this context, we will briefly discuss selected biological effects of VR games and aerobic exercises in obese children.

Key Words: Virtual reality, Aerobic exercises, Cycle ergometer training, Obese children.

INTRODUCTION

Childhood obesity is a result of chronic positive energy balance with intake exceeding expenditure required for growth, homeostatic maintenance, and physical activity. Pediatric weight management is a complex issue, as obesity is a multifactorial condition due to environmental, social, and behavioral factors (1). Childhood obesity is associated with several adverse health risks, including increased risk of coronary heart disease, dyslipidemia, insulin resistance, hypertension, and weight-related psychological stress. Obesity in childhood often persists into adulthood. In addition, it poses significant economic burdens: medical costs are 30% higher for children who have obesity than children who stay at a healthy weight (2). Virtual reality (VR) technology is a promising platform to be included in obesity therapy as it provides a safe environment for learner experimentation, real-time personalized behavioral weight management tasks, and strategies. Moreover, obesity can target negative emotions and body image dissatisfaction, which play a critical role in the onset and maintenance of this disorder (3).

VR is a set of fancy technologies used to create a simulated environment; an interactive 3D visualization system (a computer, a game console, or a smartphone) supported by one or more position trackers and a head-mounted display. The trackers sense the movements of the user and report them to the visualization system, which updates the images for display in real time. However, psychology and neuroscience define VR as an advanced form of human-computer interface that allows the user to interact with and become immersed in a computer-generated environment in a naturalistic fashion (4). Physical fitness in children and adolescents is considered an important indicator of health (5). Few studies have analyzed the relationship between physical fitness and quality of life (QOL) in children. A positive relationship between aspects of QOL and cardiorespiratory fitness (CRF) has been observed in children and adolescents (6). Aerobic exercises have little effect on gross measures such as body weight and body mass index (BMI) but are usually associated with favorable changes in body composition (7). Aerobic exercise may decrease body fat, and attenuate the loss of lean body mass seen in children during dietary energy restriction (8). Aerobic activities, such as walking, have been suggested to improve aerobic physical fitness, quality of life, and mood disorders (9). However, due to monotony and the difficulty of performing weight-bearing activities, adherence to these types of activities can be low, especially among obese children (10).

Discussion

The VR exercise program can effectively reduce the BMI and the level of depression and increase the level of exercise fun and exercise immersion in overweight middle-aged women (11). However, the continuity of these effects requires further verification through repeated studies in the future (12). AVG programs showed positive effects on BMI, body fat percentage, and cardiorespiratory fitness. AVG could be a good strategy to combat childhood obesity (13). The effects of VR showed that body adiposity was improved as cholesterol, low-density lipoprotein (LDL), triglycerides, leptin and fatty acid concentrations, fat percentage, and waist-hip ratio were all decreased. Also, the inflammatory mediators associated with cardiovascular risks as tumor necrotic factor and C-reactive protein were also shown to decrease significantly following the training period (14).

Importantly, recent studies have demonstrated that exercise training

improves vascular endothelial function, an important surrogate measure that may predict future atherosclerotic risk in obese children and adolescents (15). Aerobic exercise improves LDL and triglycerides (TG) concentrations. Moreover, the programs based on combined exercise (≥ 60 min, > 75% maximum heart rate) also improved high-density lipoprotein (HDL) concentration (16). The reduction of leptin concentration to aerobic exercises and explicated these changes on the basis that aerobic training induces considerable physiological adaptations and alters the concentration of other hormones such as insulin, cortisol, catecholamine, and others which in turn alter leptin concentration (17). Comparing the biological and motivational effects of aerobic exercise with VR glasses and traditional exercise methods revealed that practice with VR glasses has greater motivational effects than the latter (18).

Conclusion

Virtual reality exercises and aerobic exercises can have positive biological effects on obese children. Virtual reality exercises can be a more attractive intervention than aerobic exercises in obese children.

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