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Exergames - Turn Kids "On" To Real Exercise

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Abstract
Background*: Digital games, a winning combination of gaming with exercise, known as exergames, can improve youths' health status. The prevalence of overweight children and adolescents has increased drastically over the past several decades due to physical inactivity and sedentary video gaming. This increase is troubling given the potentially numerous adverse health implications.[1] Transforming sedentary video game play into active exergame play could increase caloric expenditure and provide psychosocial and cognitive benefits by increasing self-esteem, social interaction, motivation and visuospatial skills. This article summarizes the literature on exergames, showing the potential of exergames to improve the physical health, as well as transfer effects that may benefit related social, cognitive and academic outcomes.*
Keywords*: exergames, youth, calorie expenditure, social development, cognitive development, physical health*

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I. Introduction

Exergaming, a combination of "exercise" and "gaming" is a new term used for interactive digital video games that are also a form of exercise. It features player movement, such as would occur in "real-life" exercise participation. These active video games have the potential to increase energy expenditure during otherwise sedentary video gaming and may provide a viable adjunct to more traditional exercise.[2]

Exergames depends upon Motion sensor technology, an alternative to foot-operated pads, which uses a camera interface or controller device to transfer a player's image or movement to a screen. A major breakthrough in motion sensor technology was the Nintendo Wii, which uses an accelerometer within the Wii remote and a sensor bar to detect movement. For example, virtual Wii baseball requires the player to swing a Wii remote controller at a symbolic ball thrown by an animated onscreen character; the sensor bar picks up these actions, and the game displays them onscreen to represent the player.[3]

While the Wii has been seen as being more physically demanding than sedentary game consoles, a study published in the British Medical Journal found that while playing, the Wii uses significantly more energy than playing sedentary computer games.[2] Hence this article summarizes the literature on exergames, showing the potential of exergames to improve the physical and psychological health, as well as transfer effects that may benefit related social, cognitive and academic outcomes and also emphasized their role and significance in rehabilitation, medical treatment and physical education courses.

PHYSICAL OUTCOMES

Exergames can provide both direct physical benefits for youth and transfer of athletic skills to other activities. As rate of obesity is increasing everyday around the world, exergames that provide both exercise and gaming have emerged as an innovative tool for coping this crisis.[4] The positive and prevailing relationship between obesity and sedentary behavior among both adults and children is well documented. The inactivity caused by various factors such as overexposure to the front of the television, lack of exercise, and others show up as often being a factor for obesity. Also according to the author, obese children may be part of those risk groups most likely to suffer various types of disorders in adulthood such as hypertension, respiratory diseases, heart disorders, diabetes, among others.[5]

One primary goal of exergaming is to get children "off the couch" and be more active. Accordingly, children in laboratory studies briefly increased their levels of physical fitness as a result of exergaming.[2] Transforming sedentary video game play into active exergame play could increase caloric expenditure and improve coordination and athletic skills, thereby combating obesity.

Energy expenditure and increase heart rate

Exergame play increases calorie expenditure, heart rate, and coordination. Frequent exergame play can contribute to fitness and weight loss over time.[6] Playing Wii Active cooperatively with peers over a 7-month period resulted in weight loss for overweight and obese youth when compared with a control condition.[7]

With the commercial successes of Nintendo Wii and Dance, Dance Revolution (DDR) video games, the merging of gaming with exercise has proved a winning combination. Over the past decade, studies have shown that game play is comparable in intensity to physical activities such as walking or jogging [8]; increases exercise adherence[9]; and develops and maintains physical fitness.[6]

Exergame play doubled energy expenditure when compared with sedentary screen time for 8 to 12 year old children who played EyeToy and DDR.[10] Exergame play also increases heart rate, a facet of aerobic activity needed for physical fitness.[6] DDR play doubled resting level heart rates during a 45-min period.[11] Playing at the medium and lowest level of DDR intensity met standards by increasing the heart rates enough for cardiorespiratory fitness in both an active and less fit participants.[12,6]

PSYCHOSOCIAL OUTCOMES

Digital gaming is often an opportunity and experience for social interaction with peers. It may influence friendship selection and self-esteem of teenagers.

Social experience

Exergames can encourage friendships among players, hence reducing the risk of loneliness and social isolation.[13]Young adults ranked fun as the primary reason for playing DDR, followed by social interaction, working out, dancing, enjoying the game's challenge.[2] Young adults who ranked staying fit as a top reason for playing reported the most enjoyment and developed more friendships via DDR. This preference for social interaction also promotes multiplayer and group game play over solitary exercise.[14]

Self-esteem and mood elevation

Adolescents report that criticism by peers and self inhibition because of overweight are barriers to physical activity.[15] Exergame play allows youth to take their eyes off their peers and enhance their attention toward a screen. Game play may decrease body self-consciousness during physical activity. It was reported that preadolescent children who frequently played DDR had increased self-esteem.[16] Exercise improves mood[17] and help in boosting the morale of the young adults. Among 168 college students, exercise groups who played an exergame or who used a cycle ergometer showed higher positive moods after completing the exercise than a control group who played the video game without exercise.[18]

Motivation and coordination skills

Exergames are intrinsically motivating, interesting, energizing and rewarding[19], responding to a player's actions and challenging them at multiple levels of expertise.[20] Exergame play may also motivate other physical activities. Many exergames such as DDR or Wii Sports tennis require rapid hand–eye or foot–eye coordination, hence helping in enhancing and improving the motor skills and dexterity.[21]

II. Cognitive And Academic Performance

Exergame play may improve cognitive performance, in particular improving perpetual skills, by enhancing cardiorespiratory functioning.[22,7] This occurs because of increased aerobic activity leading to enhanced physiological and neurological mechanisms that occur during physical activity. Hence it helps in improving the cognitive performance by increasing cerebral circulation and increased neurotransmitter release.[23]

Spatial awareness and attention capacity

Exergame play improves visual–spatial skills including spatial relations and visualization.[24] Game play also improves attention capacity of the players by enhancing ability to process information over time, hence monitoring a number of tasks in one go.[25]

Academic benefits

As digital games are highly encouraging and interesting, there regular and repeated practices results in increasing academic performance like problem solving and pattern recognition, hence beneficial for academic and social success.[26] Because video games are engaging and motivating, and they provide repeated practices and rewards , gaming could improve academic performance. Specifically, video games improve cognitive outcomes that are beneficial for academic success, including problem solving, hypothesis testing, estimation, pattern

recognition, memory, and judgment.[27] Indeed, 120 third- and fourth-grade students who played a dance-pad game demonstrated improved academic performance and social success.[28]

ROLE IN PHYSICAL EDUCATION COURSES

Physical education courses are a promising venue for youth to play exergames.[29] Throughout the United States, exergames like DDR are being incorporated into physical education classes, recesses, lunchtimes, and after-school programs. These games have received positive feedback from students, parents, and teachers.[11] Exergames offer activity opportunities for youth such as bicycling, dancing, aerobics, kickboxing, and martial arts.[3]

REHABILITATION AND MEDICAL TREATMENT

The prevalence of serious neurological cases like Cerebral Palsy (CP), Multiple Sclerosis (MS), and Cerebro-vascular Accident (CVA) is progressively increasing over the years.[30] Not only the neurological incidence has its remarkable effect on the patients and societies, but also the phase after it that is more challenging and time consuming. Therefore, Nintendo Wii console (exergame) is being introduced and studied for rehabilitation from neurological problems and shows the positive physiological and psychological effect of this gaming system when being introduced into medical intervention.

Effect on stroke and multiple sclerosis

It has been revealed that up to 85% of stroke patients experience a stage of motor and sensory control loss that affects the quality of their life. Many studies have been conducted to study the effectiveness of exergames or virtual reality (VR) as treatment and rehabilitation system for stroke and all kinds of cerebro-vascular accidents. Different measurement tests showed a significant improvement in upper limb function of the post stroke patients.[31] Other studies also concluded that Wii has a positive effect upon the brain injury rehabilitation.[32] and is very much feasible, effective, and inexpensive option. A longitudinal pilot study examined the potential of Nintendo Wii Fit to increase physical activity behavior among people with multiple sclerosis and hence improve their fitness levels.[33]

Effect on cerebral palsy and balance problems It was reported that a chronic need for intensive rehabilitation session is highly required for children with any neurological defects. A research was conducted in 2010 to study the effect of Wii rehabilitation on children of cerebral palsy(CP). Measurements of the hand function were measured using grip strength and the results showed a significant increase and improvement in the child's hand function after conducting a training course.[34]Also many researches have been studying the validity and reliability of Wii for treating and overcoming balance problems. A study conducted in 2010 was based on a comparison between the Wii Balance Board (WBB) and a laboratory-grade force platform (FP) and found that the WBB has the potential to 'bridge the gap' between laboratory testing and clinical assessment of standing balance.[35]The participant trained by Wii had activities that stimulate balance, coordination and strengthening.

III. Conclusion

The results of the study will help us in creating awareness among the society about health education. Exergames can be used as health tools. Wii has proved to have positive changes in self-perception and improve social, psychological and physiological wellbeing.

Incorporating exergames into schools, health clubs, and homes can promote healthy youth development and combat the childhood obesity crisis. Exergames can become one of the most popular, engaging, and health-promoting homework assignments. Exergames can appeal to both video gamers and those looking for alternatives to traditional exercise. They can also target unfit, sedentary and often "hard-to-reach" individuals. Schools can integrate exergames into their physical education programs, community centers can dedicate rooms specifically for game play. Above all, it has now also entered into medical field for treatment and rehabilitation purposes. But although Wii console is amusing and highly effective, it may be associated with some problems and dangers while using this gaming system as a treatment intervention. Similar to sporting, stretching is highly recommended before playing exergames otherwise patient might suffer from muscle injury or fatigue. However, it is a good one time investment which will help in boosting up further more dedicated studies.

References

[1]. Pirazzini KE , Kraus RM. Exergame Lab- Physiological Response of a Gaming Session with the Nintendo Wii Fit (Exergame) Interactive Video Game. www.exergamelab.org/2010/06/physiological-response-of-gaming.html
[2]. file:///C:/Users/DELL/Downloads/Exergaming - Wikipedia, the free encyclopedia.html
[3]. Lieberman DA. What can we learn from playing interactive games? In: Vorderer P, Bryant J, editors. Playing video games: Motives, responses, and consequences. Mahwah, NJ: Erlbaum; 2006: 379–397.

[4]. McGinnis JM, Gootman JA, Kraak VI. The Committee on Food Marketing and the Diets of Children and Y outh, Food and Nutrition Board, Board on Children, Youth, and Families, Institute of Medicine of the National Academies. Food marketing to children and youth: Threat or opportunity? Washington, DC: The National Academies Press; 2006

[5]. Barros M , Neves A. Exergames: The role of ergonomics and design in helping to control childhood obesity through physical and functional exercise program. Work. 2012; 41: 1208-1211.

[6]. Unnithan VB, Houser W, Fernhall B. Evaluation of the energy cost of playing a dance simulation video game in overweight and non-overweight children and adolescents. International Journal of Sports Medicine. 2006; 27: 804–809.

[7]. Staiano AE, Terry A, Watson K, Scanlon P, Abraham A, Calvert SL. Physical activity intervention for weight loss in overweight and obese adolescents. Poster presented at the biennial meeting of the Society for Research in Child Development; Montreal, Canada. 2011.

[8]. Maddison R, Mhurchu CN, Jull A, Jiang Y , Prapavessis H, Rodgers A. Energy expended playing video console games: An opportunity to increase children's physical activity? Pediatric Exercise Science. 2007; 19: 334–343.

[9]. Warburton DER, Bredin SSD, Horita LTL, Zbogar D, Scott JM, Esch BTA, et al. The health benefits of interactive video game exercise. Applied Physiology, Nutrition, and Metabolism. 2007; 32: 655–663.

[10]. Lanningham-Foster L, Jensen TB, Foster RC, Redmond AB, Walker BA, Heinz D, et al. Energy expenditure of sedentary screen time compared with active screen time for children. Pediatrics. 2006; 118: 1831–1835.

[11]. Hindery R. Japanese video game helps people stay fit and lose weight. New York: Associated Press Worldstream; 2005.

[12]. Tan B, Aziz AR, Chua K, The KC. Aerobic demands of the dance simulation game. International Journal of Sports Medicine. 2002;23:125–129.

[13]. Mueller F, Agamanolis S, Picard R. Exertion interfaces: Sports over a distance for social bonding and fun. Conference on human factors in computing systems, Proceedings of the SIGCHI conference on human factors in computing systems; Ft. Lauderdale, FL: Association of Computing Machinery, Conference on Human Factors in Computing Systems; 2003: 561–568

[14]. Chin A, Paw M, Jacobs W, Vaessen E, Titze S, vanMechelen W. The motivation of children to play an active video game. Journal of Science and Medicine in Sport. 2008;11:163–166.

[15]. O'Dea J. Why do kids eat healthful food? Perceived benefits of and barriers to healthful eating and physical activity among children and adolescents. Journal of the American Dietetic Association. 2003;103:497–501.

[16]. Brubaker B. Teachers join the Dance Dance Revolution: Educators begin training to use the exercise video game. The Dominion Post. 2006 Mar 11

[17]. Plante TG, Coscarelli L, Ford M. Does exercising with another enhance the stress-reducing benefits of exercise? International Journal of Stress Management. 2001;8:201–213.

[18]. Russell WD, Newton M. Short-term psychological effects of interactive video game technology exercise on mood and attention. Educational Technology & Society. 2008;11:294–308.

[19]. Baranowski T, Buday R, Thompson DI, Baranowski J. Playing for real: Video games and stories for health-related behavior change. American Journal of Preventive Medicine. 2008;34:74– 82.

[20]. Malone T. Towards a theory of intrinsically motivating instruction. Cognitive Science. 1981; 4: 333–369.

[21]. Drew B, Waters J. Video games: Utilization of a novel strategy to improve perceptual motor skills and cognitive functioning in the noninstitutionalized elderly. Cognitive Rehabilitation. 1986;4:26–34.

[22]. Hertzog C, Kramer AF, Wilson RS, Lindenberger U. Enrichment effects on adult cognitive development: Can the functional capacity of older adults be preserved and enhanced? Psychological Science in the Public Interest. 2009;9:1–65.

[23]. Etnier JL, Nowell PM, Landers DM, Sibley BA. A meta-regression to examine the relationship between aerobic fitness and cognitive performance. Brain Research Reviews. 2006;52:119–130.

[24]. Subrahmanyam K, Greenfield PM. Effect of video game practice on spatial skills in girls and boys. .Journal of Applied Developmental Psychology. 1994;15:13–32.

[25]. Green C, Bavelier D. Action video game modifies visual selective attention. Nature. 2003;423:534–537.

[26]. Höysniemi J. Unpublished doctoral thesis. University of Tampere; Finland: 2006. Design and evaluation of physically interactive games.

[27]. Sheff D. Video games: A guide for savvy parents. New York: Random House; 1994

[28]. Shasek J. Unpublished report. RedOctane; Sunnyvale, CA: 2004. Exerlearning: Movement, fitness,dance, and learning.

[29]. Yang S, Smith B, Graham G. Healthy video gaming: Oxymoron or possibility? Journal of Online Education. 2008; 4(4).

[30]. MacDonald BK, Cockerell OC, Sander JW, Shorvon SD. Brain 2000;123: 665-76.

[31]. Nijland R, Wegen EV, Verbunt J, Wijk RV, Kordelaar JV, Kwakkel G J. Rehabil Med. 2010 ;42(7):694-6.

[32]. Loureiro R, Valentine D, Lamperd B, Collin C, HarwinW.Gaming and Social Interactions in the Rehabilitation of Brain Injuries: A Pilot Study with the Nintendo Wii Console. In book: Designing Inclusive Interactions; Jan 2010:219-28.

[33]. Plow M, Finlayson M. Potential benefits of nintendowii fit among people with multiple sclerosis: a longitudinal pilot study. Int J MS Care. Spring 2011;13(1):21-30.

[34]. Golomb MR, McDonald BC, Warden SJ, Yonkman J, Saykin AJ, Shirley B. In-home virtual reality videogame telerehabilitation in adolescents with hemiplegic cerebral palsy. Arch Phys Med Rehabil. 2010 ;91(1):1-8.

[35]. Clark R, Bryant AL, Pua Y, McCrory P, Bennel K, Hunt M. Validity and reliability of the Nintendo Wii Balance Board for assessment of standing balance. Gait & Posture 2010; 31(3):307-10.

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