TECHNOLOGY AND MOTOR ABILITY DEVELOPMENT

Lin Wang[1], Yong Lang[2] and Zhongmin Luo[3]
[1]*Department of Health & Kinesiology, University of Texas-Pan American, Edinburg, TX, U.S.A.*
[2]*Department of English, University of Texas-Pan American, Edinburg, TX, U. S. A.*
[3]*Department of Foreign Languages, Hengyang Normal University, Hunan, China*

ABSTRACT

As a new member joining the technology family, active video games have been developed to promote physical exercise. This working-in-progress paper shares an ongoing project on examining the basic motor abilities that are enhanced through participating in commercially available active video games.

KEYWORDS

Active Video Games, Motor Abilities, Physical Exercise

1. INTRODUCTION

Active video games (exergames), as the latest wave of video games, have not been around long. However, they have already exerted a huge behavioral impact on consumers and attracted devotees of all ages, from toddlers to grade schoolers to grown-ups.

Active video games have been introduced as a technology tool that has health benefits (Staiano & Calvert, 2011). By combining videogames playing and being physically active, motivation of participants have been reported to steady high for both relaxation and achievement (Pasch, Bianchi-Berthouze, van Dijk, & Nijholt, 2009). Mimicry of movements, proprioceptive feedback, as well as physical challenge, was recommended by researchers to make the commercial product more welcoming. It is the purpose of this pilot study to examine the true impact of active video game playing on basic motor abilities.

Are movements required to complete active video games participation serving the purpose of being physically active at the same time advancing motor skill development? Few studies in the current research literature have examined the efficacy of the solution provided by the game industry. With the available exergames out in the market, no evaluation, to our knowledge, has been conducted on the physical abilities these games were designed to promote.

Nintendo Wii was one of the first company to introduce exergame concept in the 80’s (Bumham, 2001), then the PlayStation and Kinect game consoles advanced the physical involvement in playing the games by using user’s own body as the controlled (Witherspoon & Manning, 2012). What fundamental motor skills have been improved by playing active video games remains unanswered. To be able to make the best out of the games handy to young consumers, knowing how much and what improvement that active game playing can have in fundamental motor skills, is the impetus for an evaluation system to be in place. This piece of information is also critical to teachers and parents to have when designing the best curriculum in school for students and/or setting up an environment at home that is most beneficial for children and youth at a particular developmental stage.

Purpose of this project was to examine the different physical abilities that can be enhanced by active video games out on the market. More specifically, perception from users will be collected to answer the research question of what physical abilities are enhanced by the exergames commercially available.

ISBN: 978-989-8533-30-2 © 2014

2. LITERATURE REVIEW

Current literature presents evidence in supporting and against the use of technology in promoting physical activeness. Supporting research emphasizes the inclusion of all age group and performance level by technology, as well as the valiance of weather condition, geological location, a buddy to play with, and so on. Benefits for kids from playing active video games have been reported in improving eye-hand coordination (Hotz, 2012), visual and attentional skills such as memory (Boot, Kramer, Simons, Fabiani, & Gratton, 2008), and tactics and strategy (Glass, Maddox, & Love, 2013 and Queen Mary, 2013). Active video games are also found to help increase energy expenditure and movement for children (average of 12 years old) (Lanningham-Foster, Foster, McCrady, Jensen, Mitre, & Levine, 2009). Energy expenditure is significantly higher for those users who are engaged lower body movement compare to upper body engagement (Biddiss & Irwin, 2010). Moreover, over-weight children (10-14 years of age) can benefit from participating in active video games (Maddison, Foley, Mhurchu, Jiang, Jull, Praparessis, Hohepa, & Rolgers, 2011).

Contrarily, arguments can be found in the current research literature against the use of video games since they are associated with the inappropriate use of games, such as, one of the video games that engages killing (Salbella, 2013). Virtual games presents the user a special conditioning to be desensitized from less physiological aroused by real violence prone to getting into violent behavior as a result (Carnagey, Anderson & Bushman, 2007; Anderson & Dill, 2000). Moreover, participants (11 year olds) of active video games reported to have increased energy expenditure not at the level of recommended standard of 60 minutes of daily moderator (White, Schofield, & Kilding, 2011).

Divergent to the cognitive enhancement by playing video games and active video games, studies to examine how motor skills are enhanced are scarce (Delgado-Mata, Ruvalcaba-Manzano, Quezada-Patino, & Gomez-Pimentel, 2009). The limited effort has been put in the area of game designing to foster gross and fine motor skill development. Impact of commercially available exegames on the motor skill development has not been studied.

3. METHDOLOGY

In evaluating active video games, very limited literature can be found to have probed into the exact physical abilities enhanced from participation. As a remedy for this absence, this pilot survey study is designed to include basic physical abilities and see if any of the abilities are strengthened by exergames commercially available in the market.

Eleven fundamental motor skills recommended by the Department of Education from Victoria were used for survey development for this project. Specifically, the fundamental motor skills included are catch, kick, run, vertical jump, overhand throw, ball bounce, leap, dodge, punt, forehand strike, and two-hand side-arm strike.

Participants, a voluntary convenience sample, were college students with junior or senior status majoring in Kinesiology and have had at least one course of training in movement evaluation. They were asked to self-report and comment on the motor abilities built by engaging in active video games from their own experiences.

4. FINDINGS AND DISCUSSIONS

Fifty-eight active video games (AVG) were evaluated by 25 participants (15 male; 9 female). Each participant was asked to pick the active video games that they were familiar to play with. Out of the 58 active video games reported, 12 were eliminated at the final evaluation due to either a non-active in nature, i.e. NBA 2K12; a mobile application such as Julian Michael Fitness; or a hand-held DS such as Winter Sports Feel the Spirit.

Forty-six of the different AVG came from three main manufactures, Wii (Nintendo), X-Box (Microsoft), and PlayStation (Sony). Of the 46, 19 were Wii games, 14 X-box 360, and 5 PlayStation games. At the same time, there were 5 that were double dipped in either Wii and X-box or X-Box and Playstation. 4 games were triple dipped in all three forms.

Of the 11 evaluated basic motor skills, 19 Wii games had a range of 1-11 and an average of 4.157 inclusion of the basic motor skills. The games that are with the best inclusion was Wii Fit.

X-box had a smaller product pool evaluated with a range of 0-10 and an average of 4.785 basic motor skill inclusion. The game that had the highest rate in basic motor skills covered was Kinect Sports.

Playstation had only 5 games and a range of 0-6 and an average of 2.8 basic motor skills covered of the 11 basic motor skill mentioned.

Four double dipped games had a range of 2-5 and an average of 3.75 of the basic motor skills included, while 4 tripped dipped games had a range of 3-10 and an average of 6.25 inclusion of the 11 basic motor skills. See Table 1 below for detailed statistical description.

Table 1. AVG Information And Evaluation

AVG	Number of Games	Evaluation		
		Range	Ave # of Basic Motor Skills Included	Highest # Covered
Wii	19	1-11	4.157	Wii Fit (11)
X-Box	14	0-10	4.785	Kinect Sport 10)
PlayStation	5	0-6	2.8	Mortal Kobat (6)
Double Dipped	4	2-5	3.75	Fifa2014 (5)
Triple Dipped	4	3-10	6.25	NFL training camp (10)

Development of a particular basic motor skill was also evaluated. Leap, dodge, and over hand throw were included in a little over half of all evaluated commercially available active video games with 56.5%, 54.3%, and 50% respectively. Ball balance and forehand strike were evaluated to be included in 45.7% of all games while run and two-hand strike were included in 43.5%. Catch, kick, vertical jump, and punt were found to be at the lowest rates of inclusion, 26%, 21.8%, 39.1%, and 23.9% respectively. Table 2 presents the inclusion percentage of the basic motor skill in AVG.

Table 2. Inclusion percentage of the basic motor skills in AVG

Basic Motor Skills	Inclusion Percentage in the 46 AVG (%)
Catch	26
Kick	21.8
Run	43.5
Vertical Jump	39.1
Overhand Throw	50
Ball Balance	45.7
Leap	56.5
Dodge	54.3
Punt	23.9
Forehand Strike	45.7
Two-hand Strike	43.5

It is interesting to notice that Wii Fit has showed an inclusion of all 11 basic motor skills in designing of the game. The commercial market definitely needs a push in the direction of including all basic motor skills to enhance a true benefit from a balanced basic motor skill design to correct the current impact of temporary energy expenditure that do not sustain due to drop out of the participants (Barnett, Certain, & Baranowski, 2011).

ISBN: 978-989-8533-30-2 © 2014

5. CONCLUSIONS

The findings from this pilot study have shown trends of basic motor abilities enhancement through active video games playing. This pilot study is an initial effort of an on-going project to study the impact of commercially available active games, and sport specific video games on the learning of that sport skill. As a final product of this project, an evaluation system for commercially available active video games to foster effective learning/practicing of a particular skill in active game users will be designed and developed.

REFERENCES

Anderson, C. A., & Dill, K. E. (2000). Video games and aggressive thoughts, feelings, and behavior in the laboratory and in life. *Journal of Personality and Social Psychology*, *78*(4), 772-790.

Barnett, A., Certin, E., & Baranowski, T. (2011). Active video games for youth: A systematic review. *Journal of Physical Activity and Health, 8*, 724-737.

Biddiss, E., & Irwin, J. (2010). Active video games to promote physical activity in children and youth. *Archives of Pediatrics and Adolescent Medicine, 164*(7), 664-672.

Boot, W. R., Kramer, A. F., Simons, D. J., Fabiani, M., & Gratton, G. (2008). The effects of video game playing on attention, memory, and executive control. *Acta Psychologica*, *129*(3), 387-398.

Burnham, V. (2001). *Supercade: A visual history of the videogame age, 1971–1984*. Cambridge, Massachusetts: MIT Press.

Carnagey, N.L., Anderson, C.A., & Bushman, B.J. (2007). The effect of video game violence on physiological desensitization to real-life. *Journal of Experimental Social Psychology*, *43*, 489–496.

Delgado-Mata, C., Ruvalcaba-Manzano, R., Quezada-Patino, O., & Gomez-Pimentel, D. (2009). Low cost video game technology to measure and improve motor skills in children. *Proceeding of IEEE AFRICON 2009* (pp. 1-6), Nairobi, Kenya.

Glass, B. D., Maddox, W. T., Love, B. C. (2013). Real-time strategy game training: Emergence of a cognitive flexibility trait.

PLoS ONE, *8*(8), e70350 DOI: 10.1371/journal.pone.0070350

Hotz, R. L. (2012). When gaming is good for you. Retrieved August 25, 2014, from http://online.wsj.com/news/articles/SB10001424052970203458604577263273943183932.

Lanningham-Foster L., Foster, R. C., McCrady, S. K., Jensen, T. B., Mitre, N., & Levine, J. A. (2009). Activity-promoting video games and increased energy expenditure. *The Journal of Pediatrics*, June Issue, 819-823.

Maddison,R., Foley, L., Mhurchu, C. N., Jiang, Y. N., Jull, A., Prapavessis, H., Hohepa, M., & Rodgers, A. (2011). Effects of active video games on body composition: A randomized controlled trial. *American Journal of Clinical Nutrition*, *94*, 156-163.

Queen Mary University of London. (2013). Playing video games can boost brain power. *ScienceDaily*, 21 August 2013. Retrieved August 25, 2014, from http://www.sciencedaily.com/releases/2013/08/130821094924.htm.

Salbella, R. A. (2013). Negative potential of video games. Retrieved February 27, 2013, http://www.education.com/reference/article/negative-potential-video-games/.

White, K., Schofield, G., & Kilding, A. E. (2011). Energy expended by boys playing active video games. *Journal of Science and Medicine in Sports*, *14*, 130-134.

Witherspoon L., & Manning, J. P. (2012). Active gaming: The future of play? *American Journal of Play*, Spring Issue: 464-487.