

IMPACT OF VIRTUAL AND FUNCTIONAL REALITY TRAINING ON THE MOBILITY AND BALANCE OF SCHOOLCHILDREN: A Randomized Clinical Trial

Joelma Maria de Deus dos Santos¹

Yury Monteiro Reis²

Ana Alice Leão de Sousa³

Gileno Edu Lameira de Melo⁴

Cláudia Santos Oliveira⁵

Evangelical University of Goiás – UniEVANGÉLICA³⁴⁵

Faculty of Medical Sciences, Santa Casa de São Paulo⁵

State University of Pará – UEPA¹²⁴

ABSTRACT

Mobility and balance are motor skills developed especially in childhood and during early schooling. Encouraging activities that promote body control is essential to prevent delays in motor development that can affect adult life. This study evaluated the effects of virtual reality training and functional training on the mobility and balance of schoolchildren. The sample included 60 students from a public school, divided into three groups: control (CG), functional training (FTG), and virtual reality (VRG). Before and after the interventions, participants were assessed with the Timed Up and Go test (TUGi), using the G-Walk-BTS inertial sensor to measure mobility and balance. The results showed that the GRV group presented a significant improvement in the total duration of the TUG test in the post-training assessment compared to the pre-training assessment and the control group in the post-training assessment (8.91 ± 1.33 p < 0.0001). The GTF group also showed a significant improvement in the total duration of the TUG test in the post-training assessment compared to the control group (8.31 ± 1.14 p < 0.0001). In addition, the functional group obtained significant results in the duration of the walk and return in the post-training assessment compared to the control group (1.93 ± 0.56 and 1.67 ± 0.29 p < 0.0001). It is concluded that both virtual reality training and functional training are effective in improving mobility and balance in schoolchildren.

KEYWORDS: Control; Mobility; Assessment; Balance.

INTRODUCTION

Motor development is a process of changes in motor behavior, and such changes occur due to the maturation of the central nervous system, which occurs during childhood, as at this stage children are acquiring significant skills for their learning process, such as activities to coordinate and control movements effectively (MEDINA et al. 2008; WILLRICH; AZEVEDO; FERNANDES, 2009).

For children with motor difficulties, movement can be a major adversity, making it impossible for them to perform typical childhood tasks. Among these

motor difficulties is Motor Development Disorder (MDD). MDD is considered to be the absence of physical and neurological disorders, in which there is impairment in the development of motor skills (BELTRAME et al., 2017).

Recent studies have shown positive effects of virtual reality games on improving functional skills in children, such as the study conducted by Snider, Majnemer, and Darsaklis (2010). Exergames, used as a tool in school physical education, provide results on the function of physical effort, as they allow motor learning and the improvement of aspects related to health and physical fitness (MEDEIRO et al., 2017).

On the other hand, functional training in Physical Education classes is characterized by physical exercises aimed at improving functional capacity, as it works with exercises that have the specific purpose of improving physical qualities such as balance, strength, motor coordination, endurance, laterality, and flexibility (BASTOS et al., 2016).

There are few studies on the use of Virtual Reality (VR) and Functional Training (FT) in the school environment to improve mobility and balance. These studies are important because they seek to determine the best training methods to improve motor skills, enabling their application in schools to develop students' functional abilities. Thus, the study is relevant because it offers learning strategies for functional mobility. The objective is to evaluate the effects of VR and FT training on the functional mobility and balance of schoolchildren, seeking to clarify the effectiveness of these methods for functional development and motor skills in the school context.

MATERIALS AND METHODS

The study was conducted in a public school in Altamira, PA, with the participation of 60 students of both sexes, aged between 8 and 11 years old, from the 4th and 5th grades of elementary school. The students were randomly divided into three groups: Control Group (CG), which attended regular physical education classes; Virtual Reality Group (VRG), which used games such as Just Dance 2016, Kinect Sports, and Kinect Adventure; and Functional Training

Group (FTG), which participated in functional training circuits. Each group participated in six training sessions and was evaluated before and after the intervention using the *Timed Up and Go* (TUGi) test. For this evaluation, the G-WALK inertial sensor (Gsensor, BTS Bioengenharia S.p.A., Italy) was used to record acceleration signals and the times required to perform the simple phases of the TUG test. Statistical comparisons were made using one-way analysis of variance (ANOVA), followed by Tukey's post hoc test for multiple comparisons, using GraphPad Prism 7 software. The level of significance adopted was $p < 0.05$.

The research was approved by the Ethics Committee of the Marco Teodorico Campus II/UEPA Health Center, according to opinion No. 3,423,816.

RESULTS

Data from 60 students were analyzed, of whom 25 (41.7%) were girls and 35 (58.3%) were boys, aged 10.45 ± 1.1 , weighing 34.63 ± 9.39 , and measuring 1.40 ± 0.7 . Table 1 shows that the Virtual Reality (VR) group showed a significant improvement in the total duration of the TUG test in the post-training assessment compared to the pre-training assessment and also in relation to the control group in the post-training assessment. The Functional Training (FT) group, in the post-training assessment, showed improvement in the total duration of the TUG test compared to the Control Group (CG) in the pre- and post-training assessments.

Regarding the duration of the round-trip walks, the functional group obtained significantly better results in the post-training evaluation when compared to the control group in the pre- and post-training evaluations. However, in the other stages of the TUG test, no significant differences were observed in the pre- and post-training evaluations.

Table 1 – Stages of the Timed Up and Go test with mean and standard deviation of the Control, Virtual Reality, and Functional groups.

Variables	GRV Pre	GC Pre	GTF Pre	RV Post	GC Post	GTF Post	<i>p</i>
-----------	------------	-----------	------------	------------	------------	-------------	----------

Total test duration	10.26 ± 2.28	9.92 ± 0.76	9.45 ± 1.28	8.91 ± 1.33**	10.28 ± 0.82	8.31 ± 1.14##	<0.0001
Duration of the lifting phase	1.22 ± 0.32	1.08 ± 0.26	1.28 ± 0.35	1.10 ± 0.27	1.18 ± 0.25	1.11 ± 0.27	0.2018
Walking (Going)	2.39 ± 0.78	2.79 ± 0.45	2.31 ± 0.73	2.23 ± 0.60	2.79 ± 0.52	1.93 ± 0.56##	<0.0001
Duration of intermediate rotation phase	1.66 ± 0.43	1.56 ± 0.44	1.52 ± 0.31	1.63 ± 0.37	1.56 ± 0.56	1.70 ± 0.35	0.7390
Walking (Return)	2.06 ± 0.76	2.41 ± 0.43	1.98 ± 0.52	1.98 ± 0.66	2.47 ± 0.56	1.67 ± 0.29##	<0.0001
Duration of sitting phase	1.49 ± 0.38	1.34 ± 0.36	1.60 ± 0.32	1.32 ± 0.59	1.14 ± 0.53	1.39 ± 0.90	0.157

* vs. **VR-Pre**; # vs. **Cont-Pre**; † vs. **Cont-Post**; Values in mean ± standard deviation from the mean;

Legend: VRG: Virtual Reality Group; CG: Control Group;

Source: Field Research

CONCLUSION

It was found that the VR group and the FT group showed efficiency in improving mobility and balance. In the other stages of the TUG test, no significant results were found. Thus, it can be seen that virtual games and functional training are excellent alternatives for improving physical education classes, as they promote the development of motor skills by working with body movements.

It is noted that further research on this topic is needed to support the findings of this study, in order to seek new ways to treat children with motor development problems.

ACKNOWLEDGMENTS

The authors would like to thank the Brazilian funding agencies and universities for their financial support: National Council for Scientific and Technological Development (CNPq), Coordination for the Improvement of Higher Education Personnel (Coordenação de Aperfeiçoamento de Pessoal de Nível Superior, CAPES), and the Goiás State Research Support Foundation (Fundação de Amparo à Pesquisa do Estado de Goiás, FAPEG). Evangelical University of Goiás – UniEVANGÉLICA. State University of Pará – UEPA.

BIBLIOGRAPHICAL REFERENCES

BASTOS, Gabriel Rodrigues et al. Functional training in physical education classes: contribution of functional training to better levels of health-related physical fitness. *Revista Uniplac, Lages*, v. 4, n. 1, 2016.

MEDINA, Josiane et al. The effect of learning tips on the acquisition of the fish roll by children with TDC. *Revista Brasileira de Ciências do Esporte*, v. 29, n. 2, 2008.

WILLRICH, Aline; DE AZEVEDO, Camila Cavalcanti Fatturi; FERNANDES, Juliana Oppitz. Motor development in childhood: influence of risk factors and intervention programs. **Revista Neurociências**, v. 17, n. 1, p. 51-56, 2009.

BELTRAME, Thais Silva et al. Prevalence of Developmental Coordination Disorder in a sample of Brazilian children. **Cadernos de Terapia Ocupacional da UFSCar**, v. 25, n. 1, 2017.

MEDEIROS, Pâmella de et al. Exergames as a tool for acquiring and developing motor skills and abilities: a systematic review. **Revista Paulista de Pediatria**, v. 35, n. 04, p. 464-471, 2017.

SNIDER, Laurie; MAJNEMER, Annette; DARSAKLIS, Vasiliki. Virtual reality as a therapeutic modality for children with cerebral palsy. **Developmental neurorehabilitation**, v. 13, n. 2, p. 120-128, 2010.