Available online at http://www.journalijdr.com

IJDR

ISSN: 2230-9926

International Journal of Development Research
Vol. 10, Issue, 01, pp. 33435-33441, January, 2020

RESEARCH ARTICLE OPEN ACCESS

EFFECTS OF EXERGAMING ON THE QUALITY OF LIFE AND FUNCTIONAL CAPACITY OF UNIVERSITY STUDENTS

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ARTICLE INFO

Article History:
Received 19th October, 2019
Received in revised form
17th November, 2019
Accepted 20th December, 2019
Published online 31st January, 2020

Key Words:

Health promotion, Physical exercise, Quality of life, Virtual reality.

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ABSTRACT

The objective of this study was to evaluate a training protocol with the use of exergames in university students. Participated of this study 43 university students that were divided into two groups: Control Group and Protocol Group that was submitted to 33 sessions of exergames.The World Health Organization Quality of Life Instrument questionnaire was used as a tool for pre and post-intervention evaluation, a six-minute walk test for functional capacity assessment and anthropometric measures for body mass index calculation. There was a statistically significant difference, with $p \leq 0.05$ in the BMI of the GP from 24.00 ± 5.98 to 23.85 ± 5.51. Regarding quality of life, there was a significant increase in the environmental domain obtained by the protocol group, from 65.3 ± 13.7 to 69.6 ± 13.2 and in the psychological domain when comparing the control group with the protocol group, obtaining $p = 0.02$. In the six-minute walk test, the distance obtained was also increased, from 559.02 ± 105.97m to 631.00 ± 105.92m ($p = 0.00$) and the distance traveled (74.37% to 83.95% and $p = 0.00$). The practice of physical exercises with the use of exergames contributes positively to the improvement of the general health of university students.

Citation: ***Danielle de Freitas Gonçalves, Juliana Ribeiro Gouveia Reis, Caroline da Silva Ribeiro, Alessandro Reis, Marisa Afonso Andrade Brunherotti and Maria Georgina Marques Tonello.*** **2020.** "Effects of exergaming on the quality of life and functional capacity of university students", *International Journal of Development Research*, 10, (01), 33435-33441.

INTRODUCTION

The World Health Organization (WHO) treats health as the "complete state of physical, mental and social well-being and not merely the absence of disease or illness" (WHO, 1996). This concept has a great connection with health promotion, since it works to improve the well-being of the community, considering the physical, mental and social aspects. Among the various fields of health promotion, there is the incentive to practice physical activities, which aims to improve health through actions aimed at a healthier lifestyle (Brazil, 2002). Physical inactivity, considered an important modifiable cardiovascular risk factor, refers to little or no physical activity practice. According to the Brazilian Society of Cardiology (SBC) in 2014, the association between lack of exercise and poor eating habits is changing the cardiovascular profile of the population, leading to early clinical manifestations of cardiovascular disease (CVD) and increased incidence of factors. Risk factors such as overweight and physical inactivity. Noncommunicable diseases (NCDs), such as CVD, have a negative impact on the country's economic situation, causing permanent disabilities, in addition to the high costs of treatment. Health promotion interventions aimed at combating these diseases, from a perspective related to physical activities, reflect in the minimization of expenditures of the Unified Health System (SUS), besides acting in the improvement of the population's quality of life and in relation to preventable diseases and deaths (Moretti *et al.,* 2009). For Santos *et al*., (2014), we hear more often that sedentary lifestyle is presented only by adults and elderly people, but sedentary lifestyle is increasingly present in the daily lives of young people, especially in college students. Morais *et al*., (2011) state that the incentive to perform physical activities in universities, with the inclusion of these practices in disciplinary grids, can become a strategy aimed at reducing cardiovascular risk factors in college students, especially in relation to physical inactivity. Thus, the assessment of functional capacity, used for the elderly population, is now used for young individuals, especially for sedentary people. Gonçalves *et al*., (2010) stated that the assessment of functional capacity and physical fitness is fundamental for the promotion of an active lifestyle. In addition, Cordeiro *et al*., (2002) indicate functional capacity, specifically motor dimension, as an important marker of quality of life. There is evidence in the literature that physical inactivity is considered a contributing factor to a decline in the quality of life of college students. The practice of physical activity is a strategy that can reverse this situation, because active students have better behavior related to health issues, such as biological rhythms, sleep, work ability, energy for daily activities and locomotion (Cieslak *et al.,* 2012, Maciel *et al.,* 2013).

Virtual reality (VR) is considered an innovative way to facilitate young people's engagement to change their lifestyle, making them healthier and more active. The method proposes a playful and interactive form, which makes physical exercises less tedious than conventional ones (Ilha and Bernardi, 2011). In addition, the dedication to leisure, with a predominance of healthy behaviors, leads to a better level of quality of life and health promotion among individuals (Pucci *et al.,* 2012). In VR, body movement, considered a fundamental characteristic for this type of games, is performed through games called Exergames (EXGs). EXGs, which use consoles such as Xbox360®, Nintendo® Wii and PlayStation®2, are increasingly being used as a form of physical activity for individuals of different age groups due to the many benefits involved. This tool provides practitioners with the development of sensory and motor skills, and is an excellent option for overcoming barriers of physical inactivity (Vaghetti and Botelho, 2010, Cavalli *et al.,* 2014). Despite the many benefits that EXGs have, it is clear that the practice of physical activities through VR is still little used in the routine of college students, due to the high rate of sedentary lifestyle and obesity that this population presents. However, it is believed that this tool is capable of promoting improvements in the functional capacity of these individuals due to the large energy expenditure provided by the EXGs, as well as improving the body composition and raising the quality of life levels of this population, thus providing the good being and social interaction.

College students face stressful situations during their academic career. This often makes them not include exercise in their routine in order to increase their dedication to studies, becoming less active. According to Calais *et al*., (2007) university entrance can generate specific stressors in college students, which contributes to a worsening of their physical and mental health. Among the various stressors presented by the students, there is anxiety, fear, insecurity generated by doubts, disappointment with the chosen career, distancing from the family, acquisition of new and greater responsibilities. Given this, it is extremely important health promotion actions aimed at empowering this population, addressing the positive impact of an active lifestyle in improving the health and quality of life of this population, as, Calais *et al*., (2007) state that the undergraduate period is considered a risk phase for college students, with a predisposition for the development of mental disorders due to stressors and bad healthy habits, such as physical inactivity during this period. The general objective of this study was to evaluate the effects of a training protocol using EXGs on functional capacity, quality of life and body mass index (BMI) of college students.

MATERIAL E METHODS

This is a prospective, quantitative and comparative interventional study, which was conducted in a physiotherapy school-clinic, located in a university in the interior of the state of Minas Gerais. Visits were made in classrooms of university night classes, in order to invite students to participate in the study. During the visits, the purpose of the work was explained and evaluations were scheduled with the 72 students who showed interest in participating in the study. This study included night students duly enrolled at the university, of both sexes, aged between 18 and 35 years, from any undergraduate course and who agreed to participate in the study by signing the Informed Consent Form (ICF). Students who did not attend the initial assessment, who missed sessions three consecutive sessions, or who had any illness (eg infections, pneumonia) that required isolation or rest were excluded. Forty-three students participated in this research, which were divided by draw into two groups: control group (CG) composed of 21 participants (48.84%) with a mean age of 21.11 ± 4.2 months and protocol group (GP), consisting of 22 participants (51.16%), with a mean age of 20.3 ± 1.8 months. The evaluation was performed before and after the intervention with EXGs, in a period of 11 weeks. Initially, all participants underwent anthropometric data collection to calculate BMI. To measure height and total body mass, a WELMY / Model 110-CH mechanical anthropometric scale was used. The procedures were performed with the participants barefoot and wearing light clothes (previously advised). BMI was calculated by dividing body mass in kilograms by height square in meters (weight / height2).

To assess quality of life, participants completed the WHOQOL-bref questionnaire before and after EXG training. This instrument was proposed by the World Health Organization (WHO) to measure health-related quality of life (HRQoL). It consists of 26 questions, which are grouped into four domains: physical, psychological, social and environment. Functional capacity was measured from the distance the participants were able to walk in a period of six minutes. For this, the 6MWT was performed, which was applied before and after the intervention with EXGs, at approximately the same time of day to minimize intraday variability. This instrument is effective in reflecting the degree of functionality of the exercises performed by the population (Bosco, 2005). On the day before the 6MWT, participants were instructed to wear comfortable clothes and shoes. The tests were performed individually on a track, with footage markings, following the ATS standardization (2002). The following equipment was used: BD® sphygmomanometer; BD® stethoscope; Nonin® brand pulse oximeter; Stopwatch in regressive mode; Two chairs to mark the answer points. The 6MWT recommends that participants remain seated for at least 10 minutes before the test to assess vital data. Blood pressure (BP) was measured using sphygmomanometers and BD® stethoscope, respiratory rate (RR) was obtained by counting the breath cycles in one minute, heart rate (HR) and oxygen saturation (SatO2). Nonin® pulse oximeter was used. After measuring these measures, the participants 'dyspnea degree was evaluated using the Borg scale, which is a subjective perception of effort scale, with scores from zero to ten, considering the participants' resting state at zero and ten, respectively. state of exhaustion (Borg, 1982). Subsequently, the timer was set to 6 minutes and participants received the following instructions:

- Walk as much as possible in six minutes, walking back and forth on the track, around the chairs;
- Slow down or stop if necessary;
- If you stop, you may lean against the wall while resting, but you should resume walking as soon as possible.

The participant was positioned at the starting line and as soon as he started walking the timer was triggered. Each time the participant returned to the starting line, a dash was marked on the data collection form. With a uniform tone of voice, standard encouragement phrases were used such as: "You're doing well. You have 5 minutes"; "Keep up the good work. You only have 2 minutes." When it was only 15 seconds after completion, the following sentence was said: "In a moment, I will tell you to stop. When I do, define exactly where you are and I will come to you." After six minutes, participants were instructed stopping at exactly where they were to count the distance traveled on the last lap. Finally, the examiner brought a chair to the participant and the final test measurements were collected. Through the 6MWT, the obtained distance (OD) was measured, while the predicted distance (SD) was determined by the reference equations for the 6MWT distance prediction, according to Enrigth and Sherill (1998), as follows: SD = (7 .57 X Height cm) - (5.02 X Age) - (1.76 x Weight Kg) - 309m for men and SD = (2.11 X Height cm) - (2.29 x Weight Kg) - (5 , 78 x Age) + 667m for women.

After these procedures, CG participants were instructed to maintain their usual activities, while the GP underwent 33 training sessions using EXGs, held in a room of the university's physiotherapy clinic, three times a week, lasting 30 minutes each session. It is noteworthy that all sessions were supervised by the researcher. The video game used for training was the Xbox 360® Kinect TM (microsoft). The Kinect® sensor is an instrument responsible for the interconnection between the video game and the player, which is able to identify each participant through an identifier (ID), allowing its recognition at each session. Therefore, at first, this sensor has been calibrated to recognize all body movements. After adjusting the motion sensor, all participants had previous contact with the chosen game, aiming at learning. The game selected to perform this protocol was Just Dance, which consists of a series of music and dance games, which aims to follow the movements performed by the character. The choice of the game was made for two reasons: the fact that it has fast movements, which require greater physical effort on the part of the participant and, consequently, an improvement in cardiovascular conditioning and the promotion of social interaction between players, since it is possible that up to six people play at the same time.

After 11 weeks of training, participants in the GC and GP were invited to return to the university's physiotherapy clinic for a new anthropometric data collection, to answer the WHOQOL-bref questionnaire again, and to perform a reassessment of the 6MWT. After this process, the results were analyzed and compared with each other. The data were analyzed comparatively using SPSS software version 17. Two statistical tests were applied, besides the comparison of the variables by means and standard deviations. The Wilcoxon test was applied to compare values from paired samples, aiming to verify the existence or not of statistically significant differences between two series of values. The Mann-Whitney U test has the same objective, but its application was performed to compare values from independent samples. Through these tests a probability value was reached, with the significance level set at $p \leq 0.05$ in a bilateral test. The project was submitted to the Ethics and Research Committee of the University Center of Patos de Minas (UNIPAM) and approved under opinion CAAE No. 53298516.2.0000.5549. Only after approval, data were collected.

RESULTS

The sample consisted of 43 university students of both sexes, divided into two groups. The CG consisted of 21 (48.84%) participants with a mean age of 21.11 ± 4.2 years and the PG, composed of 22 (51.16%) participants with a mean age of 20.3 ± 1. ,8 years. Table 1 represents through means and standard deviation, the comparison of the results obtained by the 43 participants of this study (CG and PG), in the pre-intervention situation, in relation to age, BMI, domains of the WHOQOL-bref questionnaire (physical, psychological, social and environmental), DPre, DO and percentage of distance traveled (D%) recorded in the 6MWT, which was used to assess the participants' functional capacity. Due to the fact that there were no statistically significant differences between the values of the analyzed variables, when comparing the results obtained by the CG and PG (intergroup analysis), in the first evaluation, the groups were considered homogeneous. Table 2 is represented by the values of means, standard deviation and probabilities found by the two groups in pre and post-intervention situations, related to age, BMI, domains of the WHOQOL- bref questionnaire (physical, psychological, social and environmental), DPre., OD and percentage of distance traveled (D%) found in the 6MWT.

Table 1. Comparison of the measurements obtained by the 43 participants of this study (CG and PG), in the pre-intervention situation

Variáveis	CG (N21)	PG (N22)	p
Age (years)	21,11±4,2	20,3±1,8	0,10
BMI (kg/m²)	21,42±3,4	24,00±5,98	0,41
FD	76,5±15,3	73,5±16,5	0,60
PD	68,3±12,8	71,8±13,2	0,49
SD	75,0±14,9	81,0±19,9	0,12
ED	65,6±11,6	65,3±13,7	0,86
DPre (m)	773,04±47,00	751,66±38,21	0,33
DO (m)	592,62±137,11	559,02±105,97	0,21
D% (%)	76,66	74,39	0,43

BMI - Body Mass Index, FD - Physical Domain, PD - Psychological Domain, Sd - Social Domain, ED - Environment Domain, DPre - Expected Distance, DO - Distance obtained, D% - Percentage of distance traveled (DO / DPx100), Mann-Whitney test with statistical significance of $p \leq 0.05$.

According to the results, statistically significant differences were found between the values of BMI, ED, OD, D% obtained by PG, and the results obtained after the intervention, higher than the first. The differences found in the CG were not statistically significant in any variable. After the intervention period, the measurements obtained by both groups were again compared, seeking to identify if they would remain homogeneous (Table 3).

Table 2. Mean values, standard deviations and probabilities found, relative to the measurements obtained by the 43 participants of this study (CG and PG), in pre and post intervention situations

Variáveis	GC (N21)			GP (N22)		
	Pré	Pós	p	Pré	Pós	p
Age (years)	21,11±4,2	21,11±4,2	1,00	20,3±1,8	20,3±1,8	1,00
BMI (kg/m²)	21,42±3,4	21,39±3,79	0,90	24,00±5,98	23,85±5,51	0,03*
FD	76,5±15,3	74,3±10,7	0,11	73,5±16,5	76,4±13,0	0,08
PD	68,3±12,8	65,9± 8,7	0,17	71,8±13,2	71,8±9,9	0,93
SD	75,0±14,9	73,0±14,2	0,18	81,0±19,9	81,3±18,8	0,85
ED	65,6±11,6	64,4±9,7	0,38	65,3±13,7	69,6±13,2	0,00*
DPre (m)	773,04±47,00	772,30±46,76	0,13	751,66±38,21	751,75±36,40	0,83
DO (m)	592,62±137,11	583,90±141,39	0,20	559,02±105,97	631,00±105,92	0,00*
D% (%)	76,66	75,60	0,16	74,39	83,93	0,00*

BMI - Body Mass Index, FD - Physical Domain, PD - Psychological Domain, Sd - Social Domain, ED - Environment Domain, DPre - Expected Distance, DO - Distance obtained, D% - Percentage of distance traveled (DO / DPx100), Wilcoxon test with statistical significance of $p \leq 0.05$.

Table 3. Comparison of the measurements obtained by the 43 participants of this study (CG and PG), in the post-intervention situation

Variáveis	GC (N21)	GP (N22)	p
Age (years)	21,11±4,2	20,3±1,8	0,10
BMI (kg/m²)	21,39±3,79	23,85±5,51	0,27
FD	74,3±10,7	76,4±13,0	0,53
PD	65,9± 8,7	71,8±9,9	0,02*
SD	73,0±14,2	81,3±18,8	0,05
ED	64,4±9,7	69,6±13,2	0,12
DPre (m)	772,30±46,76	751,75±36,40	0,35
DO (m)	583,90±141,39	631,00±105,92	0,05*
D% (%)	75,60	83,93	0,00*

BMI - Body Mass Index, FD - Physical Domain, PD - Psychological Domain, Sd - Social Domain, ED - Environment Domain, DPre - Expected Distance, DO - Distance obtained, D% - Percentage of distance traveled (DO / DPx100), Mann-Whitney test with statistical significance of $p \leq 0.05$.

Through this analysis, statistically significant differences were found between the values of SD, DO and D% in the post-intervention situation, with no significance in any variable in the initial assessment. Thus, it is suggested that at the end of the intervention, the groups were considered heterogeneous, and the GP presented significant improvements in relation to quality of life and functional capacity, as already shown.

DISCUSSION

The results of this study indicate that the intervention with EXGs was able to promote benefits in the body composition of the participants due to the reduced BMI of the GP, as well as an improvement in the quality of life (psychological and environmental domains) and the students' functional capacity. due to increased walking distance on the TC6M. The lack of regular physical exercise brings several impairments for individuals, such as reduced functional capacity and physical fitness, propensity to develop overweight and obesity, and impairment in their overall health and quality of life. Given this, the identification of the population most exposed to these factors, as well as the elaboration of strategies to reduce them, is extremely important for the scope of health promotion. Regarding BMI, this study found a statistical difference of this variable after training with EXGs. These results differ from the study by Brandão *et al*., (2017), whose authors are found significant differences in participants' BMI when compared pre- and post-intervention with EXGs. The training protocol was held for six months, twice a week lasting 30 minutes each session. Maddison *et al*., (2011) evaluated the effect of EXGs over a 24-week period on total body mass, body composition, physical activity and physical fitness of sedentary individuals. Participants were randomly divided into two groups (CG and PG) and the Sony Play Station EyeToy (Sony) video game was used using a variety of games, including dance games. Participants were instructed to follow current physical activity recommendations (60 minutes of moderate to vigorous physical activity on most days of the week). After 26 weeks, the authors identified a statistically significant effect on the reduction of BMI and body fat in the PG, showing no significant differences for the CG. Ni Mhurchu *et al*., (2008) evaluated the effect of EXGs on physical activity levels of sedentary individuals, with game intervention during 12 weeks, using the PlayStation®2 console. Participants were divided into two groups (CG and PG), and the CG was instructed to maintain their usual activities, while the PG provided an active video game update package consisting of an EyeToy® camera, EyeToy® active games and dance floor According to the results found, there was a significant total body mass loss in the PG, which is also similar to the current study. According to the authors, the 12-week intervention period is considered sufficient time to observe changes in physical activity by means of EXGs. Regarding the quality of life, there is a significant improvement in the environmental domain of the GP, when compared to the first with the second assessment and psychological domain when compared to the CG and PG, in the second assessment. This suggests that physical activity may promote quality of life benefits for college students.

The impairment of the psychological domain of quality of life of university students, especially in the first year of the course, may be related to the difficulty of adapting to the university routine, considering that a long time of dedication to the assimilation and compression of the content is necessary (Paro and Bittencourt, 2013). This period of adaptation often causes students to increase their time of study, thus causing the lack of opportunities to perform activities that provide recreation and leisure, can lead to decline in the quality of life of this population in relation to the environmental domain. Evaluation of the effects of Microsoft Kinect EXGs on quality of life domains is still poorly performed and may be considered a new methodology. The first study was developed by Brandão *et al*., (2017), which assessed the influence of games on the quality of life of their participants, by applying the WHOQOL-bref questionnaire. Two sessions of EXGs were held per week for six months, in the afternoon, lasting 30 minutes each session and using games with Kinect. As in the present study, a significant improvement was identified in relation to the environmental domain, when comparing the pre and post intervention moments. For the authors, Kinect EXGs are considered a pleasurable and playful way that can complement traditional physical activity programs. Considering that EXGs can be considered a modality of physical activity, contributed to the positive relationship in the participants' quality of life. Thus, several studies were found to confirm this association, such as the study by Silva *et al*., (2010), who sought to associate the practice of physical activity with the quality of life of students, teachers and employees of a university, by applying the WHOQOL-bref instrument and the usual life questionnaire. By crossing the data, the authors found results that resemble the present study, as they found that active individuals had significantly higher quality of life scores compared to sedentary individuals, in relation to their physical, psychological and environmental domain. A similar study was performed by Cieslak *et al*., (2012). They sought to analyze the quality of life from the WHOQOL-bref questionnaire and the physical activity level of college students, separating the sample in relation to the participants' gender. As a result, the authors identified that the domains of quality of life and the level of physical activity differ between the sexes and show strong positive relationships in this population. However, the results were contradictory with the present study, because as in the study mentioned above, the environmental domain presented the lowest rates for both sexes.

In the present study, positive associations were found between the psychological domain of quality of life and EXG training. The probable mechanisms involved in this association were suggested by Costa, Soares and Teixeira (2007), who point out the possibility that physically active people at any age have better mental health than sedentary ones. According to the authors, physical activity induces the production and release of endorphins. This hormone is capable of causing a state of natural euphoria, reducing psychological discomfort, improving mood and providing a state of well-being to practitioners. In this study, we found an improvement in the participants' functional capacity, considering that there were significant differences in relation to PG DO after intervention. The assessment of functional capacity through the application of the 6MWT is more evident in the literature for the elderly population. Despite being indicated for healthy individuals of different age groups, according to Pires *et al*., (2007), no studies were found that associated this test with training using EXGs in college students. However, Lima (2017) evaluated the functional capacity of the elderly through the application of the 6MWT, before and after an intervention with Xbox Kinect for six weeks. Despite being composed of a different population, the results obtained by the author are similar to the present study, since an improvement of this variable was identified due to the increase in the average of OD by the participants after the intervention. In addition, an improvement in other functional capacity parameters such as lower limb strength and dynamic balance was identified. Thus, the improvement of the participants' functional capacity, registered in the increase of the DO in the 6MWT, can be explained in the literature, because the energy expenditure promoted by the physical activity through EXGs, increases the aerobic capacity of the practitioners. Several studies have evaluated the level of energy expenditure during physical activity through the EXGs. Bailey and McInnis (2011) consider EXGs an alternative form of exercise to improve physical fitness. They conducted a study to examine the potential effect of interactive digital game activities (EXGs) on energy expenditure and in all assessed activities, energy expenditure was raised to a moderate to vigorous intensity level, increasing from four to eight times. above home in various types of games. It was also identified that EXGs compared with walking on a treadmill at five kilometers per hour, and depending on the game used, energy expenditure may be higher than walking. Regarding this statement, Pirrier-Melo *et al*., (2013) conducted a study to analyze the physiological responses of HR and BP during and after an EXG session using the Xbox360º Kinect® in four different games. As in the previous study, the authors found that intervention with EXGs resembles conventional moderate-intensity physical activities, improving the conditioning of practitioners. Similar results were found by Maddison *et al*., (2007), who in assessing the energy expenditure of their study practitioners using EXGs over short periods of time (five minutes), observed that it is associated with the level of intensity of traditional physical activities such as walking and trotting. According to the authors, this practice, if practiced often enough and long enough, can contribute to improving the health and physical fitness of the most sedentary practitioners.

Several studies have shown that through physical activity using VR, it is possible to achieve the appropriate physical activity parameters as established by the American College of Sports Medicine (ACSM). Among them is the study by Biscaia, Martins and Alves (2014), who evaluated the potential of using the Move Fitness video game for PS3 as a physical activity focused on the aerobic performance of young adults between 18 and 29 years old, aiming to verify if The protocol fits the cardiovascular training parameters defined in the literature. It has been found that EXGs provide adequate activities to achieve the parameters recommended by ACSM and AHA (American Heart Association). However, the energy expenditure promoted by the EXGs may change according to the training game chosen. Several studies associate higher energy expenditure in dance games, such as Just Dance and Dance Dance Revolution® (Gao *et al.,* 2012, Neves *et al.,* 2015, Trout and Zamora, 2008). This can happen because the movement of dancing promotes feelings of well-being in individuals, increasing adherence to exercise, and the need for quick moments and to be performed. The practice of physical activities using EXGs can be a potentially innovative strategy and can be used in the context of health promotion. According to Bailey and McInnis (2011), training reduces sedentary time, increases adherence to exercise programs and promotes pleasure to players. This practice can be used for populations at risk, especially for sedentary and overweight individuals.

The study showed several evidences of the benefits that physical activity brings to college students. Based on the results found, it is suggested that the practice of physical activities with the use of EXGs contributes positively to the improvement of the general health of practitioners, including physical aspects and quality of life, considering the psychological and environmental domains. The execution of the EXG protocol proposed by the study was able to promote an improvement in the quality of life of the GP participants, especially in the environmental domain. There was also a significant improvement in practitioners' functional capacity as well as a reduction in BMI. This fact may be associated with choosing the game for the protocol. Just Dance is a music and dance game that requires a high physical effort from the players, because it presents fast movements to be performed by them. Thus, there was a high energy expenditure of the participants of the PG, contributing to the improvement of functional capacity and weight loss. Further studies are suggested for the expansion of knowledge about the use of EXGs as a form of physical activity, as well as the long-term effects of this practice. It is also necessary, the empowerment of health professionals to use this resource, improving its use in health promotion actions, such as the implementation of this strategy in universities, seeking physical and psychological benefits through a health-friendly environment.

Acknowledgments

This study was financed in part by the Coordenação de Aperfeiçoamento de Pessoal de Nível Superior - Brasil (CAPES).

REFERENCES

ATS. 2002. Committee on Proficiency Standards for Clinical Pulmonary Function Laboratories. ATS statement: guidelines for the six-minute walk test. *American Journal of Respiratory and Critical Care Medicine.* 166(1), pp.111-117. Disponível em: <https://www.ncbi.nlm.nih.gov/pubmed/12091180>.

Bailey, BW., McInnis, K. 2011. Energy Cost of Exergaming: A Comparison of the Energy Cost of 6 Forms of Exergaming. *Archives of Pediatrics and Adolescent Medicine.* 165(7), pp.597-602.

Biscaia, R., Martins, R., Alves, S. 2014. Aplicabilidade do jogo MoveFitness como ferramenta de treino aeróbio: Uma comparação com diretrizes atuais que definem os vários níveis de intensidade de treino aeróbio. Salutis scientia. 6, pp.32-39.

Borg, G. 1982. Psycophysical bases of perceived exertion. Medicine And Science In Sports And Exercise. 14, pp.377- 381.

Bosco, AD 2005. Avaliação do teste de caminhada dos seis minutos e do teste de função pulmonar em pacientes submetidos ao transplante pulmonar. Mestrado. Dissertação em Ciências Médicas. Universidade Federal do Rio Grande do Sul, Porto Alegre (RS) Brasil.

Brandão, OS., Neto, IVS., Rauber, SB. *et al*. 2017. Impacto de Exergames na qualidade de vida de idosos. Fisioterapia Brasil. 18(3), pp. 320-328.

Brasil 2002. Ministério da Saúde. Secretaria de Políticas de Saúde. Projeto Promoção da Saúde. As Cartas da Promoção da Saúde. Ministério da Saúde, Secretaria de Políticas de Saúde, Projeto Promoção da Saúde. – Brasília: Ministério da Saúde. Disponível em: <http://bvsms.saude.gov.br/bvs/publicacoes/cartas_promocao.pdf>.

Calais, SL., Carrara, K., Brum, MM. *et al*. 2007. Stress entre calouros e veteranos de jornalismo. Revista Estudos De Psicologia. 24(1), pp.69-77.

Cavalli, AS., Rota, PA., Ribeiro, JAB. *et al*. 2014. Motivação e interesse de idosos em jogar Exergames relacionados à atividade física. Proceedings of SBgames. pp. 679-682.

Cieslak, F., Cavazza, JF., Lazarotto, L. *et al*. 2012. Análise da qualidade de vida e do nível de atividade física em universitários. *Journal of Physical Education*. 23(2), pp.251-260.

Cordeiro, RC., Dias, RC., Dias, JMD. *et al*. 2002. Concordância entre observadores de um protocolo de avaliação fisioterapêutica em idosas institucionalizadas. Revista de Fisioterapia. 9, pp.69-77.

Costa, RA., Soares, HLR., Teixeira, JAC. 2007. Benefícios da atividade física e do exercício físico na depressão. Revista do Departamento de Psicologia UFF. 19(1), pp.273-274.

Enright, PL., Sherrill, DL. 1998. Reference equations for the six-minute walk in healthy adults. *American Journal of Respiratory and Critical Care Medicine.* 158(5Pt1), pp.1384-1387.

Gao, Z., Huang, C., Liu, T. *et al*. 2012. Impact of interactive dance games on urban children’s physical activity correlates and behavior. *Journal of Exercise and Science Fitness.* 10, pp.107–112.

Goncalves, LHT., Silva, AH., Mazo, GZ. *et al*. 2010. O idoso institucionalizado: avaliação da capacidade funcional e aptidão física. *Cadernos de Saúde Pública*. 26(9), pp.1738-1746.

Ilha, PV., Bernardi, G. 2011. O vídeo-game como atividade motivadora na aula de educação física. *Revista Biomotriz.* 5(1), pp.266-279.

Lima, BE 2017. Efeito do exercício crônico realizado no Xbox Kinect sobre o estado de humor e a capacidade funcional de idosos. Mestrado. Dissertação em Ciências Aplicadas à Saúde. Universidade Federal de Goiás, Jataí (GO) Brasil.

Maciel, ES., Vilarta, R., Modeneze, DM. *et al*. 2013. The relationship between physical aspects of quality of life and extreme levels of regular physical activity in adults. *Cadernos de Saúde Pública.* 29(11), pp.2251-2260.

Maddison, R. 2007. Energy expended playing video console games: an opportunity to increase children’s physical activity?. Pediatric Exercise Science, 19(3), pp.334–343.

Maddison, R., Foley, L., Ni Mhurchu, C. *et al*. 2011. Effects of active video games on body composition: a randomized controlled trial. *American Journal of Clinical Nutrition.* 94(1), pp.156-163.

Morais, CAS., Oliveira, SHV., Brandão, FC. *et al.* 2011 Fatores de risco cardiovascular em estudantes de graduação da Universidade Federal de Viçosa-MG. *Journal of the Health Sciences Institute.* 29(4), pp.261-264.

Moretti, AC., Almeida, V., Westphal, MF. *et al*. 2009. Práticas corporais/atividade física e políticas públicas de promoção da saúde. Saúde e Sociedade. 18(2), pp.346-354.

Neves, LE., Cerávolo, MP., Silva E. *et al*. 2015. Cardiovascular effects of Zumba ® performed in a virtual environment using XBOX Kinect. *Journal of Physical Therapy Science.* 27(9) pp.2863–2865.

Ni Mhurchu, C., Maddison, R., Jiang, Y. *et al*. (2008) Couch potatoes to jumping beans: a pilot study of the effect of active video games on physical activity in children. The International Journal of Behavioral Nutrition and Physical Activity. 5(8), pp.1-5.

Paro, CA., Bittencourt, ZZLC. 2013. Qualidade de vida de graduandos da área da saúde. *Revista Brasileira de Educação Médica.* 37(3), pp.365-375.

Perrier-Melo, RJ., Gomes, JLB., Oliveira, SFM. *et al*. 2013. Respostas agudas da frequência cardíaca e da pressão arterial em uma sessão de jogos de vídeo game ativos em adultos saudáveis: um estudo piloto. Revista de Terapia Ocupacional da Universidade de São Paulo. 24(3), pp.259-266.

Pires, SR., Oliveira, AC., Parreira, VF. *et al*. 2007. Teste de caminhada de seis minutos em diferentes faixas etárias e índices de massa corporal. Revista Brasileira de Fisioterapia. 11(2), pp.147-151.

Pucci, GCMF., Rech, CR., Fermino, RC. *et al*. 2012. Associação entre atividade física e qualidade de vida em adultos. *Revista de Saúde Pública*. 46(1), pp.166-179.

Santos, LR., BritoII, ECC., Neto, JCGL. *et al*. 2014. Análise do sedentarismo em estudantes universitários. *Revista de Enfermagem UERJ*. 22(3), pp.416-421.

SBC. Sociedade Brasileira de Cardiologia 2014. Consenso Sul-Americano de Prevenção e Reabilitação Cardiovascular. *Arquivos Brasileiros de Cardiologia.* 103(2), pp.1-42. Disponível em: <http://publicacoes. cardiol.br/2014/diretrizes/2014/Diretriz_de_Consenso%20 Sul-Americano.pdf >.

Silva, RS., Silva, IS., Silva, RA. *et al*. 2010. Atividade física e qualidade de vida. *Ciência e Saúde Coletiva.* 15(1), pp.115-120.

Trout, J., Zamora, K. 2008. Dance Dance Revolution: A physiological look at an interactive arcade game. ICHPERD Jour Research. 3, pp.67-72.

Vaghetti, CAO., Botelho, SSC. 2010. Ambientes virtuais de aprendizagem na educação física: uma revisão sobre a utilização de Exergames. Ciências & Cognição. 15(1), pp.76-88.

WHO. World Health Organization 1996. WHOQOL-BREF. Introduction, administration, scoring and generic version of the assessment. Programme on mental health. Disponível em: <http://www.who.int/mental_health/ media/en/76.pdf>.

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