Xi'an Shiyou Daxue Xuebao (Ziran Kexue Ban)/
Journal of Xi'an Shiyou University, Natural Sciences Edition
ISSN: 1673-064X
E-Publication: Online Open Access
Vol: 66 Issue 12| 2023
DOI: 10.5281/zenodo.10450491

IMPACT OF ONLINE AND PHYSICAL TRAINING PROGRAM ON POSTURAL SWAY AMONG YOUNG ADULTS

NOMAN AHMED

Currently Pursuing a PhD, In Physical Education at Centre for Physical Education, Health & Sports Sciences, University of Sindh, Jamshoro, Sindh, Pakistan.

SONIHA ASLAM

PhD, Currently Serving as Professor, Centre for Physical Education, Health & Sports Sciences, University of Sindh, Jamshoro, Sindh, Pakistan.

YASMEEN IQBAL

PhD, Currently Serving as an Head of Department, Department of Sports Science and Physical Education, University of Lahore, Lahore, Punjab, Pakistan.

PREM LATA

Currently Serving as Senior Lecturer, Bahria College of Physical Therapy, Bahria University of Medical and Dental College (BUMDC) Karachi, Sindh, Pakistan.

MUNEEBA AZIZ

Currently Serving as a Lecturer, Isra Institute of Rehabilitation Sciences Isra University, Karachi Campus, Sindh, Pakistan.

KHADIJATUL AIN SANDEELA

Currently Serving as a Lecturer, Isra, Institute of Rehabilitation Sciences, Isra University Karachi Campus, Sindh, Pakistan.

NASIR MEHMOOD

Currently Serving as a Lecturer, Department of Physical Therapy, The Islamiya University of Bahawalpur.

Abstract

Aim: To find the impact of online and physical training program on postural sway among young adults. **Design**: An experimental study was conducted on young adult of Pakistan. **Material and Method**: on a sample of 60 male and female young adults. Participants registered with conveniently and were divided into two groups, labeled Group A and Group B, assigned to undertake 12-week of physical and online training programs, respectively. Pre and post Postural Sway was measured. The SPSS version 25 was used to get validated frequency, percentage, standard deviation and paired t-test was used. **Result**: The training had a positive impact on the participants' ability to maintain balance and control sway in different directions. Both Groups led to statistically significant improvements with p-value <0.05 in postural stability across various conditions, both with eyes open and closed. **Conclusion**: The online and physical training programs were equally effective in reducing postural sway and improving balance among young adults.

Keywords: Postural, Sway, Online, Physical, Training, Adult, Score.

Xi'an Shiyou Daxue Xuebao (Ziran Kexue Ban)/
Journal of Xi'an Shiyou University, Natural Sciences Edition
ISSN: 1673-064X
E-Publication: Online Open Access
Vol: 66 Issue 12| 2023
DOI: 10.5281/zenodo.10450491

INTRODUCTION

The horizontal movement around the center of gravity is called postural sway. This is not a passive process, but rather a complex and active one that helps us maintain our balance while standing upright. Older people tend to sway more and rely more on visual cues to keep their balance stable. [1-2]. This happens more as people get older and is caused by a decline in the ability to control posture [3]. The center of gravity changes constantly, so sway is essential. To keep their balance, people use complex sensory information from the vestibular, somatosensory, and visual systems. These systems work together harmoniously to help people stay upright. The better the balance, the less sway there is [4]. Many factors influence how much people sway, such as body mass index, back muscle strength, stamina, weight, aging, and gender. Some health conditions can also change how people sway [5-7]. Maintaining a stable posture is important for daily life activities. The body needs to regulate the small movements (postural sway) that occur when standing upright, as they can affect performance and even cause balance loss. Recent studies have found that moving the eyes quickly (saccadic eye movements) can improve postural stability [8-10] Physical activity is a major factor in postural balance. Regular exercise is essential to maintain a high level of balance ability. Therefore, many studies have explored how different kinds of exercise and sports affect postural balance [11-14]. Moving the body with the help of skeletal muscles is called physical activity. It is a modifiable aspect of life that is important. Physical activity helps to use up energy [15]. The global pandemic of COVID-19 has changed the way people live, resulting in less physical activity and more mental health issues. People around the world walked less steps after COVID-19 was announced as a global health crisis [16]. People have used digital technology to cope with the effects of social distancing and physical inactivity during the COVID-19 pandemic, allowing them to interact socially and join physical exercise programs remotely. Digital technology, online social networks, and video chat platforms have made it easier to conduct physical training programs online [17-18] According to these last authors, online physical exercise can help prevent the harmful effects of physical inactivity and sedentary lifestyle. Online physical activity has many benefits, such as saving money (e.g., no travel costs), and reaching more people (e.g., those who live far away, in bad weather, or have social or medical limitations [19-20]

Our society has a large number of young adults. They need to be fit and healthy to contribute to the development of a healthy society. However, this group is more likely to adopt less active lifestyles due to the lockdown situation caused by the Covid-19 pandemic. This can affect their health and fitness negatively. Physical activity can help improve mental health and treat many common mental disorders. It can also help people with severe mental health disorders to cope better and recover faster. Online training programs and physical training programs are two common modalities of fitness interventions that aim to improve health and wellness. Online training programs are designed to provide personalized and interactive fitness guidance. This program beneficial according to the evidence based study.

Xi'an Shiyou Daxue Xuebao (Ziran Kexue Ban)/
Journal of Xi'an Shiyou University, Natural Sciences Edition
ISSN: 1673-064X
E-Publication: Online Open Access
Vol: 66 Issue 12| 2023
DOI: 10.5281/zenodo.10450491

METHODOLOGY

An experimental investigation was carried out over a span of six months, following ethical approval from the institute's Institutional Review Board (IRB). The study encompassed a sample size of 60 young adults aged 18 to 25 years. Participants were selected through a nonprobability convenience sampling technique, with a focus on excluding individuals with any health conditions. To assess fitness suitability prior to the commencement of the online and physical training program, the physical activity readiness questionnaire (PAR-Q) form was employed as a screening tool.

The participants were divided into two groups, labeled Group A and Group B, assigned to undertake physical and online training programs, respectively (Table 1). Those who were sick, smoker, or who have just had surgery, excluded from the study.

Table 1: Categorization of Participants

Groups (n)	Participants
Experimental Group A (30)	Performed Fitness Training Program at a Centre
Experimental Group B (30)	Performed Fitness Training Program through Online Class

Data was gathered both before and after the 12-week training program. Postural Sway was measured. A warm-up session of 10 minutes and a cool-down period of 10 minutes were included in the training's total length of 60 minutes. For a period of 12 weeks, each activity in the training program was performed for 30 seconds, with a 20-second rest between each one and a 3-minute break in between sets [21].

Table 2: Fitness Training Program

Activities	Exercises to be performed		Intensity	Duration
1. Warming up	Stretching (Dynamic)		40%–50% HR max	10 minutes
2. Training	Workouts based on resistance training	Crunches, squats, push-ups, lunges, and superman exercise	In weeks 1–8, 50%–60% HR max	40 minutes
	Aerobic workouts	Jumping jacks, on the spot running, foot stomps, and steps	In weeks 9–12, 60%– 70% HR max	
3. Cooling	Stretching (Static)		40%–50% HRmax	10 minutes

ISSN: 1673-064X
E-Publication: Online Open Access
Vol: 66 Issue 12| 2023
DOI: 10.5281/zenodo.10450491

The assessment of postural sway utilized various tools, including a sway meter, graph paper, blocks, and footprints. The sway meter comprised a 40-cm rod connected to a belt, featuring a pen at its end. It was securely fastened at the front upper hip bone level, positioned behind the subject to nullify visual influence. Subjects stood on standardized footprints on paper, maintaining a consistent 3-inch gap between their feet. The graph paper, fixed to prevent displacement, was situated behind the subject and adjusted for the initial horizontal alignment of the sway meter rod. Subjects, barefoot, were instructed to keep hands by their sides and stand as motionless as possible for each 30-second test. Clear instructions were provided before each test, and no feedback was given during the trials. A set starting point on the graph paper marked the initial position of the pen attached to the sway meter rod, which was removed after the 30-second duration [12].

To determine the frequency, mean, and standard deviation, descriptive analysis was used to analyses the collected data. Additionally, the SPSS version 25 statistical package for social sciences was used to get validated frequency, percentage, and standard deviation. A paired T-test was also used to determine whether the data was significant at a P-value of 0.05.

RESULT

The mean of participants was 22.4 ±2.242 years old, among the 60 participants, 65 were male and 24 were female. The results from Table 3, which presents the mean values of the postural sway test before and after the training program in Group A, reveal significant changes in postural stability across various conditions. In Anterior Sway with Eye Open, the mean sway significantly decreased from 1.6 ±0.32 cm before training to 0.99 ±0.46 cm after training ($p = 0.031$). This suggests an improvement in anterior postural stability with eyes open following the training program. Posterior sway showed a substantial reduction from 1.55 ±0.65 cm to 1.11 ±0.61 cm after training ($p < 0.001$). This indicates an enhancement in postural control in the posterior direction with eyes open. Lateral sway significantly decreased from 2.45 ±0.37 cm to 1.66 ±0.51 cm after training ($p = 0.002$), reflecting an improvement in lateral postural stability with eyes open. A significant reduction in right lateral sway was observed from 2.66 ±0.81 cm to 1.92 ±0.99 cm after training ($p = 0.011$), indicating enhanced stability in the right lateral direction with eyes open. Anterior sway exhibited a significant decrease from 2.5 ±0.51 cm to 1.42 ±0.72 cm after training ($p = 0.004$), suggesting improved anterior postural stability with eyes closed. Posterior sway significantly decreased from 2.6 ± 0.44 cm to 1.89 ±0.51 cm after training ($p = 0.028$), indicating improved postural control in the posterior direction with eyes closed. Lateral sway showed a significant reduction from 3.01 ±0.65 cm to 1.96 ±0.69 cm after training ($p < 0.001$), suggesting enhanced lateral postural stability with eyes closed. Right lateral sway significantly decreased from 3.22 ±0.59 cm to 2.11 ±0.64 cm after training ($p = 0.016$), indicating improved stability in the right lateral direction with eyes closed. The training program in Group a led to statistically significant improvements in postural stability across various conditions, both with eyes open and closed. These

ISSN: 1673-064X
E-Publication: Online Open Access
Vol: 66 Issue 12| 2023
DOI: 10.5281/zenodo.10450491

findings suggest that the training had a positive impact on the participants' ability to maintain balance and control sway in different directions.

Table 3. Average postural sway test scores prior to and following the training program in Group A.

Group A Mean (SD) cm			
	Pre-Training	**Post Training**	**P-value**
Anterior (Eye Open)	1.6 (0.32)	0.99 (0.46)	0.031
Posterior (Eye Open)	1.55 (0.65)	1.11 (0.61)	0.000
Lateral (Eye Open)	2.45 (0.37)	1.66 (0.51)	0.002
Right Lateral (Eye Open)	2.66 (0.81)	1.92 (0.99)	0.011
Anterior (Eye Close)	2.5 (0.51)	1.42 (0.72)	0.004
Posterior (Eye Close)	2.6 (0.44)	1.89 (0.51)	0.028
Lateral (Eye Close)	3.01 (0.65)	1.96 (0.69)	0.000
Right Lateral (Eye Close)	3.22 (0.59)	2.11 (0.64)	0.016

The results from Table 4, which outlines the mean values of the postural sway test before and after the training program in Group B. The mean anterior sway significantly decreased from 1.70 ±0.33 cm before training to 1.02 ±0.62 cm after training ($p = 0.031$). This indicates an improvement in anterior postural stability with eyes open following the training program in Group B. Posterior sway exhibited a significant reduction from 1.45 ±0.62 cm to 1.09 ±0.58 cm after training ($p = 0.012$), suggesting enhanced postural control in the posterior direction with eyes open. Lateral sway significantly decreased from 2.30 ±0.74 cm to 1.70 ±0.45 cm after training ($p = 0.001$), reflecting an improvement in lateral postural stability with eyes open. A significant reduction in right lateral sway was observed from 2.52 ±0.42 cm to 1.88 ±0.64 cm after training ($p = 0.001$), indicating enhanced stability in the right lateral direction with eyes open. Anterior sway showed a significant decrease from 2.35 ±0.69 cm to 1.53 ±0.72 cm after training ($p < 0.001$), suggesting improved anterior postural stability with eyes closed. Posterior sway significantly decreased from 2.55 ±0.46 cm to 1.93 ±0.67 cm after training ($p = 0.011$), indicating improved postural control in the posterior direction with eyes closed. Lateral sway showed a significant reduction from 3.25 ±0.81 cm to 2.001 ±0.76 cm after training ($p < 0.001$), suggesting enhanced lateral postural stability with eyes closed. Right lateral sway significantly decreased from 3.10 ±0.63 cm to 2.24 ±0.77 cm after training ($p = 0.033$), indicating improved stability in the right lateral direction with eyes closed. The training program in Group B led to statistically significant improvements in postural

ISSN: 1673-064X
E-Publication: Online Open Access
Vol: 66 Issue 12| 2023
DOI: 10.5281/zenodo.10450491

stability across various conditions, both with eyes open and closed. These findings suggest that the training had a positive impact on participants' ability to maintain balance and control sway in different directions in Group B.

Table 4. Average postural sway test scores prior to and following the training program in Group B.

Group B Mean (SD) cm			
	Pre-Training	**Post Training**	**P-value**
Anterior (Eye open)	1.70 (0.33)	1.02 (0.62)	0.031
Posterior (Eye open)	1.45 (0.62)	1.09 (0.58)	0.012
Lateral (Eye open)	2.3 (0.74)	1.70 (0.45)	0.001
Right Lateral (Eye open	2.52 (0.42)	1.88 (0.64)	0.001
Anterior (Eye close)	2.35 (0.69)	1.53 (0.72)	0.000
Posterior(Eye close)	2.55 (0.46)	1.93 (0.67)	0.011
Lateral (Eye close)	3.25 (0.81)	2.001 (0.76)	0.000
Right Lateral (Eye close)	3.10 (0.63)	2.24 (0.77)	0.033

DISCUSSION

This study adds to the existing knowledge about how physical training programs can affect postural sway. It focuses on the effects of such a program on young adults, and shows the possible benefits and outcomes of having specific interventions for this age group. The findings can help design exercise protocols and training strategies based on evidence that can improve physical fitness and postural control among young adults. Online home-based resistance exercise improved physical fitness. This suggested that online home-based resistance exercise could help fitness and mental health without using drugs. Also, the results were similar to a previous study by the similar authors [23] many studies have shown that being physically active can protect against cognitive decline and mental health problems such as depression in advance age [24] Being physically active is very important for a person’s health and well-being. It can boost mental and physical health and have long-term health benefits. It can also lower the risk of many diseases such as heart disease, cancer, and type 2 diabetes. People who exercise regularly can improve their quality of life and prevent chronic illness. It can help them in control insomnia their body weight, enhance their memory and brain functionally, strengthen the joint, muscle and improve body balance. Smartphone apps can help people stay fit and healthy at home by offering various home-based activities [25]. Regular exercise is essential for a healthy lifestyle and it can be done through innovative methods that encourage active living. Smartphone apps can be a great way to support physical activity and overall well-being. In current study show training physically as well as online makes significant effects on postural sway among young adults [26] During the COVID-19 outbreak, many people turned to digital sports activities that they could do at home. These are sports and fitness activities that use or are supported by digital media, such as apps, DVDs, technologies, videos, and live streams. Digital sports activities became popular because they allowed people to stay active and engaged while following the COVID-19 restrictions. Duration of Covid 19 situation effects the physical activity of the population, current study show that we can use online technique for fitness of the society and can use it in remote areas [27]. VRF is a new way to increase physical activity and healthy habits. It is widely used for health promotion. VR applications are important for health and fitness in this technological age. VR technology and how it can be used with common training equipment and rehabilitation methods have been of great interest in the fields of biomechanics and population health [28-29]. A study with older adults tested the effects of home-based strength training without online guidance. The results showed that the experimental group improved their lower limb strength significantly more than the control group [30]. The researchers tested how a home-based exercise program that was done remotely affected the mental state, balance, physical function, and fall risk of older adults. The exercise program helped prevent falls and improved all the other things they measured. However, exercising before the study did not make a difference [31] Cohen and Hockets taller found that telling young adults to stand with effort made them sway more and have less balance control than telling them to stand lightly or relaxed. This means that using too much muscle to stand upright can make people less steady and less accurate in keeping their balance. They also found that telling people to stand with effort made them move more in the front-back direction than telling them to stand relaxed [32] a study found that closing the eyes would make people sway more in their posture, but we only found this effect when people were not tired. When people were tired, closing the eyes did not change their posture sway. This is different from what most studies have found, which show that closing the eyes makes people sway more in their posture [33-34] In current study also found that with closing eyes participant sway more as compare to the open eyes.

CONCLUSION

In conclusion, this study showed that online and physical training programs were equally effective in reducing postural sway and improving balance among young adults. Online training programs may offer a convenient and accessible alternative to physical training programs for enhancing postural sway and balance. The study also highlighted the role of digital devices in providing feedback and motivation for postural sway training. The findings have implications for the design and delivery of balance interventions for different populations and settings.

ISSN: 1673-064X
E-Publication: Online Open Access
Vol: 66 Issue 12| 2023
DOI: 10.5281/zenodo.10450491

References

1) Parino F, Zino L, Porfiri M, Rizzo A. Modelling and predicting the effect of social distancing and travel restrictions on COVID-19 spreading. Journal of the Royal Society Interface. 2021 Feb 10; 18(175):20200875.

2) Ozili PK. Covid-19 pandemic and economic crisis: The Nigerian experience and structural causes. Journal of Economic and Administrative Sciences. 2021 Oct 22;37(4):401-18

3) Blustein DL, Duffy R, Ferreira JA, Cohen-Scali V, Cinamon RG, Allan BA. Unemployment in the time of COVID-19: A research agenda. Journal of Vocational Behavior. 2020 Jun 1; 119:103436.

4) Berduszek RJ, Geerdink H, van der Sluis CK, Reneman MF, Dekker R. Health-related physical fitness in patients with complaints of hand, wrist, forearm and elbow: an exploratory study. BMJ Open Sport & Exercise Medicine. 2021 Oct 1; 7(4):e001148.

5) Sheldon JH. The effect of age on the control of sway. Gerontologiaclinica. 1963; 5(3):129-38.

6) Horak FB, Shupert CL, Mirka A. Components of postural dyscontrol in the elderly: a review. Neurobiology of aging. 1989 Nov 1; 10(6):727-38.

7) Woollacott M, Shumway-Cook A. Attention and the control of posture and gait: a review of an emerging area of research. Gait & posture. 2002 Aug 1; 16(1):1-4.

8) Rodrigues, S. T., Aguiar, S. A., Polastri, P. F., Godoi, D., Moraes, R., and Barela, J. A. (2013). Effects of saccadic eye movements on postural control stabilization. Motriz. Rev. Educ. Fis. 19, 614–619. doi: 10.1590/S1980-65742013000300012

9) Rodrigues, S. T., Polastri, P. F., Carvalho, J. C., Barela, J. A., Moraes, R., and Barbieri, F. A. (2015). Saccadic and smooth pursuit eye movements attenuate postural sway similarly. Neurosci. Lett. 584, 292–295. doi: 10.1016/j.neulet.2014.10.045

10) Bonnet, C. T., and Baudry, S. (2016a). A functional synergistic model to explain postural control during precise visual tasks. Gait Posture 50, 120–125. doi: 10.1016/j.gaitpost.2016.08.030

11) Schmid, A.A., Van, Puymbroeck, M., Koceja, D.M., Effect of a 12-week yoga intervention on fear of falling and balance in older adults: A pilot study. Archives of Physical Medicine and Rehabilitation, 2010. 91: p. 576-583.

12) Balas, J, Bunc, V., Short-term influence of climbing activities on strength, endurance, and balance within school physical education. International Journal of Fitness, 2007. 3(2): p. 33-42.

13) Gorman, P.P., Butler, R.J., Rauh, M.J., Kiesel, K., Plisky, P.J., Differences in dynamic balance scores in one sport versus multiple sport high school athletes. International Journal of Sports Physical Therapy, 2012. 7(2): p. 148- 153.

14) Steinberg, N., Nemet, D., Pantonowitz, M., Zeev, A., Hallumi, M., Sindiani, M., Eliakim, A., Longitudinal study evaluating postural balance of young athletes. Perceptual and Motor Skills, 2016. 122(1): p. 256-279.

15) Caspersen, C. J., Powell, K. E., & Christenson, G. M. (1985). Physical activity, exercise, and physical fitness: Definitions and distinctions for health-related research. Public Health Reports, 100(2), 126–131

16) Tison, G.H.; Avram, R.; Kuhar, P.; Abreau, M.S.; Marcus, G.M.; Pletcher, M.J.; Olgin, J.E. Worldwide Effect of COVID-19 on Physical Activity: A Descriptive Study. *Ann. Intern. Med.* 2020, *173*, 767–770.

17) Cohen-Mansfield, J.; Muff, A.; Meschiany, G.; Lev-Ari, S. Adequacy of Web-Based Activities as a Substitute for In-Person Activities for Older Persons during the COVID-19 Pandemic: Survey Study. *J. Med. Internet Res.* 2021, *23*, e25848.

18) Schwartz, H.; Har-Nir, I.; Wenhoda, T.; Halperin, I. Staying physically active during the COVID-19 quarantine: Exploring the feasibility of live, online, group training sessions among older adults. *Transl. Behav. Med.* 2021, *11*, 314–322.

19) Saito, T.; Izawa, K.P. Effectiveness and feasibility of home-based tele rehabilitation for community-dwelling elderly people in Southeast Asian countries and regions: A systematic review. *Aging Clin. Exp. Res.* 2021, *33*, 2657–2669.

20) Li, F.; Harmer, P.; Fitzgerald, K.; Winters-Stone, K. A cognitively enhanced online Tai Ji Quan training intervention for community-dwelling older adults with mild cognitive impairment: A feasibility trial. *BMC Geriatr.* 2022, *22*, 76.

21) Zheng C, Huang WY, Sheridan S, Sit CH, Chen XK, Wong SH. COVID-19 Pandemic Brings a Sedentary Lifestyle in Young Adults: A Cross-Sectional and Longitudinal Study. International Journal of Environmental Research and Public Health. 2020 Jan; 17(17):6035.

22) Ramachandran S, Yegnaswamy R. Measurement of postural sway with a sway meter-an analysis. J Phys ther. 2011; 2:46-53.

23) Kikuchi, N.; Mochizuki, Y.; Kozuma, A.; Inoguchi, T.; Saito, M.; Deguchi, M.; Homma, H.; Ogawa, M.; Hashimoto, Y.; Nakazato, K.; et al. The Effect of Online Low-intensity Exercise Training on Fitness and Cardiovascular Parameters. *Int. J. Sports Med.* **2022**, *43*, 418–426.

24) Bezold, Trautwein, Barisch-Fritz, Scharpf, Krell- Roesch, Nigg, & Woll (2021). Effects of a 16-week multimodal exercise program on performance of activities of daily living in institutionalized individuals with dementia: a multicenter randomized controlled trial. *German Journal of Exercise and Sport Research*. https://doi.org/10.1007/s12662-021-00760-4.

25) Liu R, Menhas R, Dai J, Saqib ZA, Peng X. Fitness Apps, Live Streaming Workout Classes, and Virtual Reality Fitness for Physical Activity During the COVID-19 Lockdown: An Empirical Study. Front Public Health. 2022 Jun 22; 10:852311. Doi: 10.3389/fpubh.2022.852311. PMID: 35812515; PMCID: PMC9257108.

26) Glynn LG, Hayes PS, Casey M, Glynn F, Alvarez-Iglesias A, Newell J, et al.. Effectiveness of a smartphone application to promote physical activity in primary care: the smart move randomised controlled trial. Brit J General Practice. (2014) 64:7. 10.3399/bjgp14X680461

27) Bentlage E, Ammar A, How D, Ahmed M, Trabelsi K, Chtourou H, et al. Practical recommendations for maintaining active lifestyle during the COVID-19 pandemic: a systematic literature review. Int J Environ Res Public Health. (2020) 17:6265. 10.3390/ijerph17176265

28) Juras G, Brachman A, Michalska J, Kamieniarz A, Pawłowski M, Hadamus A, et al.. Standards of virtual reality application in balance training programs in clinical practice: a systematic review. Games Health J. (2019) 8:101–11. 10.1089/g4h.2018.0034

29) Qian J, McDonough DJ, GAO Z. The effectiveness of virtual reality exercise on individual's physiological, psychological and rehabilitative outcomes: a systematic review. Int J Environ Res Public Health. (2020) 17:7. 10.3390/ijerph17114133.

30) Vitale, J.A.; Bonato, M.; Borghi, S.; Messina, C.; Albano, D.; Corbetta, S.; Sconfienza, L.M.; Banfi, G. Home-Based Resistance Training for Older Subjects during the COVID-19 Outbreak in Italy: Preliminary Results of a Six-Months RCT. *Int. J. Environ. Res. Public Health* 2020, *17*, 9533.

31) Yi, D.; Yim, J. Remote home-based exercise program to improve the mental state, balance, and physical function and prevent falls in adults aged 65 years and older during the COVID-19 pandemic in Seoul, Korea. *Med. Sci. Monit. Int. Med. J. Exp. Clin. Res.* 2021, *21*, e935496.

ISSN: 1673-064X
E-Publication: Online Open Access
Vol: 66 Issue 12| 2023
DOI: 10.5281/zenodo.10450491

32) Martin J, Kearney J, Nestrowitz S, Burke A, van der Weyden MS. Effects of load carriage on measures of postural sway in healthy, young adults: A systematic review and meta-analysis. Applied Ergonomics. 2023 Jan 1; 106:103893.

33) Agostini, V., Sbrollini, A., Cavallini, C., Busso, A., Pignata, G., and Knaflitz, M. (2016). The role of central vision in posture: postural sway adaptations in Stargardt patients. Gait Posture 43, 233–238. doi: 10.1016/j.gaitpost.2015.10.003

34) Winter, D. A. (1995). Human balance and posture control during standing and walking. Gait Posture 3, 193–214. doi: 10.1016/0966-6362(96)82849-9