How to Cite:
Singh, V. R., Kumar, V., Kumari, M., Zafar, S., & Alam, S. (2022). Dynamic balance among power glass wearers: An observational study. *International Journal of Health Sciences*, *6*(S2), 12327–12331. https://doi.org/10.53730/ijhs.v6nS2.8296

Dynamic balance among power glass wearers: An observational study

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***Abstract*---**Background and purpose: -For human gait regulation and balance stability, a complicated integration of visual-vestibular and somatosensory information is necessary. The ability of the organism to maintain the center of mass balance by resisting the continual destabilizing forces that confront it may be impaired by this function of any of these components. The primary objective of the current study was to check weather wearing power glasses can affect the dynamic balance or not. Subject and Method: - An observational study was done by including 30 subjects from Delhi-NCR. The sample was drawn using the Stratified Random Sampling technique. All individuals recruited for the research are people who wear Power glasses in their daily activities and have vision problems. The individuals were asked to complete Modified Bass Test. The subjects were asked to remove the power glasses and perform the Modified bass Test. Results: - As the subjects performed the Modified Bass test of Dynamic Balance Scoring, 46.7 percent passed the test due to their balance remaining stable and 53.3 percent failed due to a lack of stability in their dynamic balance. Conclusion: - Based on the modified dynamic bass test it is concluded that Dynamic balance is affected among the power glass wearers when test was done after removing their glasses.

***Keywords*---**power glass wearers, dynamic balance, vision.

Introduction

The term "balance" is often used by health professionals across a variety of therapeutic specialities. The terms "balance" "stability" and "postural control" are often used together. Balance testing is believed to help a wide range of individuals, including those with neurological impairments, orthopaedic deficiencies, and vestibular issues. The area of an item's base of support (BOS) and the position of its center of mass (also known as the center of gravity or COG) is related to its ability to balance in a static environment. When an object's gravitational line crosses its support base, it is considered to be balanced. When the item's center of gravity is displaced from its support base, the object becomes unbalanced and falls.[1] Human equilibrium is the result of the synchronization of numerous muscles in the body as well as the integration of sensory information. [2] One of the most essential elements of coordination abilities is balance. The capacity to do a task while maintaining a stable posture is referred to as dynamic postural control (or balance). This capacity is controlled by several elements, including sensory input from the somatosensory, visual, and vestibular systems, joint range of motion (ROM), and strength, and is crucial for the proper execution of complicated sports motions and injury prevention. [3]

Balance may be seen in two ways: static and dynamic. Static balancing is the capacity to help the different postures produced by changing the contour line and the support surface breadth. [2] Static balance refers to the capacity to regulate postural release in an idle standing position. Static equilibrium is described as the capacity to anticipate and react correctly to postural changes that occur during motion. Dynamic balance is described as the capacity to anticipate and react correctly to postural changes that occur during mobility. Due to a lack of or insufficient visual perception, people with vision impairment have difficulties attaining and maintaining balance. [4]

Balance is affected by age, sports age, gender, anthropometric structure, support points, activity level, muscle tone, muscular strength, and tiredness level. It is essential to maintain equilibrium and body posture for a movement to continue. Fine motor abilities, as well as the understanding of professional tasks such as walking, running, and leaping, as well as most everyday activities, need motor coordination. Coordinated motions need proper synergistic and reciprocal muscular activity, as well as appropriate balance and posture. Visual information is essential for maintaining balance and timing psychomotor reactions, as well as calculating the velocity of body parts and objects. Partial or complete vision loss makes it difficult to maintain proper posture and balance. [4] When assessing postural stability, the motion caused by changes in the Centre-of-Pressure (COP) when standing is often used. When used to assess postural stability, the center of pressure measurements has been demonstrated to be highly reproducible and clinically relevant. Constant stress on cervical spine joints due to forward head posture results in disturbing signals to the brain that might cause decreased neck proprioception and balance ability[5] Numerous research, however, has examined these strategies' efficiency in terms of dynamic stability.

Two crucial aspects of vision that contribute to an increase in falls are contrast sensitivity and depth perception. These restrictions affect the speed and variety of

gait, standing balance, and toe clearance during ambulation. [6] MfL glasses have been shown to affect depth perception and contrast sensitivity when perceiving obstructions in the environment at critical distances. MfLs have lower depth perception and contrast sensitivity as a result of their smaller reading area. Balance and stability are harmed when depth perception and contrast sensitivity are impaired. A loss of balance control is a major cause of falls in the elderly. [7] Vision is required to assess the position and movement of the head concerning surrounding objects. Numerous studies have been conducted to test the efficiency of different motor control and spatial orienting systems by examining how the eyes, head, torso, and limbs move in sync during locomotor activity. Indeed, there is a scarcity of research on the accuracy of balance tests done with closed vs. open-eye evaluations. As a consequence, we think that the balancing performance of elite athletes is related to visual reliance, skill learning, and engagement in sports.[8]

Visual impairment makes more difficult to utilize the spatial reference system efficiently and to align the body, which has a detrimental impact on posture and balance. Due to the intricacy of the process, the ability to maintain balance may be investigated on both a physiological and functional level. The physiological evaluation entails estimating numerous components of the balance system, including the reception, integration, and effectors sections. Under dynamic situations, compensatory mechanisms were unable to fully replace vision due to increased restrictions of the oculomotor apparatus functions and loss of visual acuity and angle (which indicates erroneous and/or insufficient visual input delivery). [9] The primary objective of this study was to check weather wearing power glasses can affect the dynamic balance or not

Materials and Method

Study Design and Participants: An observational study was done to determine if wearing power glasses affected dynamic balance by using Stratified Random sampling. Ethical approval was obtained from the institutions. A total of 30 subjects were recruited from population for Delhi and NCR on the basis of inclusion and exclusion criteria. Inclusion criteria were Indian participants, both gender between 18 -26 years of age along with individuals using power glass wearers in their daily activities and have vision problems. Subjects with nervous system disorder, any Structural changes within the musculoskeletal system and who have any balance and coordination deficits were exclude from the study. After determining whether or not they met the inclusion and exclusion criteria, individuals were asked to complete Modified Bass Test. The subjects were asked to remove the power glasses and perform the Modified bass Test. Statistical analysis: All statistical analyses were carried out using SPSS version 27. Descriptive statistics were calculated for demographic characteristics including gender, age, Height, weight

	MEAN±SD
MALE (N-21)	70%
FEMALE (N-9)	30 %

Table 1: Demographic details of the subjects

Modified Bass Test of Dynamic Balance Scoring		
		Frequency
Valid	Success–	14(46.7)
	Male	78.5%
	Female	21.4%
	Fail	16(53.3)
	Male	62.5%
	Female	37.5%
	Total	30

Table 2: show the result of Modified Bass test of Dynamic Balance Scoring in which 46.7% passed in the test as there was no stability in their dynamic Balance and 53.3% failed as their balance was not affected. As the subjects performed the Modified Bass test of Dynamic Balance Scoring, 46.7 percent passed the test due to their balance remaining stable and 53.3 percent failed due to a lack of stability in their dynamic balance

Discussion

Blind or visually impaired individuals must be able to maintain their balance to perform walking-related activities. 4 The purpose of this research is to evaluate if the dynamic balance of power glass users after they remove their glasses is within the normal range. This experiment was designed to evaluate whether or not removing one's spectacles inhibits one's ability to fall. This research uncovered evidence that impairs a person's ability to walk properly. Results of present study indicated that around 53.3% of subjects failed the test. The present study has population of male (70%) and female(30%). Out of 53.3% 62.5% male and 37.5 % female. Richard et al., reported that impaired / perturbed vision increased sway and reduced balance in quiet standing. This may suggest that our proxy measures are suitable for assessing dynamic stability for this particular population.6 Milanowski et al., reorted in his study that MfLs appear to not only degrade visual performance, but also degrades key components of gait performance. Thus results in possible fall risk and gait disturbamces.7 Jazi et al., indicated that involvement in a balance-training program will significantly improve the dynamic balance of individuals with visual impairments. With improved balance, individuals with visual impairments may encounter fewer falls and experience a healthier lifestyle. [10]

This study had several limitations. The sample size is small which may limit the power of results.also, our study did not considered Elaborated physical fitness improvement programs for children and adolescents with visual impairment, diversity of age, the degree of vision loss and limitations of ablility to maintain balance. Future studies should be conducted with diiferent kind of vision problems and large sample size. Further studies are required to monitor the impact of visual training on balance.

Conclusion

Based on the modified dynamic bass test we can conclude that Dynamic balance was affected after the power glass wearers remove their glasses. MfLs appear to not only degrade visual performance, but also degrades key components of gait performance

Conflict of Interest: None

Source of Funding

Authors are self-contributor as a source of funding. Present study was not funded by any organization or agency.

Ethical Clearance

Expedited ethical approval was taken from the local ethical board, Galgotias University, Noida, Uttar Pradesh.

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