International Journal of Science and Research Archive

eISSN: 2582-8185

Cross Ref DOI: 10.30574/ijsra

Journal homepage: https://ijsra.net/

(RESEARCH ARTICLE)

Check for updates

A correlational study between Eye Hand coordination and Balance among Geriatric Badminton players

Aditi Nilesh Tikle *

Department of physiotherapy, P.E.S Modern college of Physiotherapy, Pune, Maharashtra, India.

International Journal of Science and Research Archive, 2024, 12(01), 727–730

Publication history: Received on 03 April 2024; revised on 12 May 2024; accepted on 15 May 2024

Article DOI: https://doi.org/10.30574/ijsra.2024.12.1.0855

Abstract

Playing badminton demands a high level of footwork, balance, grip, coordination, strokes, and serves accuracy. The study aims in measuring eye hand coordination and balance among geriatric badminton players. 43 geriatric badminton players, for Eye-hand coordination was assessed using the ruler drop test, while balance was evaluated using the Dynamic Gait Index (DGI). The aim of this study was to investigate the correlation between eye-hand coordination and balance among geriatric badminton players. A correlational study was conducted with 43, geriatric badminton players [71.35±4.99], and Participants completed the ruler drop test and the DGI to assess eye-hand coordination and balance, respectively. Pearson correlation coefficient analysis was performed to determine the relationship between eye-hand coordination and balance. Results: Contrary to expectations, the correlational analysis revealed no significant correlation between eye-hand coordination and balance among geriatric badminton players (r = [0.12], p > [0.416]). Thus, the findings suggest that there is no discernible relationship between these two factors in this population.

Keyword: Eye-hand coordination; Balance; Geriatric Badminton players; Ruler drop test; Dynamic Gait Index (DGI); Correlational study; Relationship; Pearson correlation coefficient .

1. Introduction

Badminton is a sport played using light weight racquets to hit a shuttlecock across a net [1]. This sport has five events: men's and women's singles, men's and women's doubles, and mixed doubles [2]. Players score points by striking a shuttlecock with their rackets so that it passes over the net and lands in the opponent's half-court [2]. The rectangular court is 44 feet (13.4 meters) long and 17 feet (5.2 meters) wide for singles, 20 feet (6.1 meters) wide for doubles [1]. A net 5 feet (1.5 meters) high stretches across the width of the court at its center. A clear space of 4 feet (1.3 meters) around the court is needed [1]. Aging is a process which causes some changes in physical, psychological, and social aspects of human body [4]. Ageing includes a decline in accommodation (presbyopia), glare tolerance, adaptation, low-contrast activity, attention visual fields and color discrimination [4].

The lean body mass declines with age and this is primarily due to loss and atrophy of muscle cells [4]. Changes in musculoskeletal system reflect the ageing process as well as consequences of a reduced physical activity. The muscle wasting in frail older persons leads to a higher incidence of falls and fractures and a functional decline [5]

The ability to manage hand and eye movements as well as how they cooperate is known as hand-eye coordination [3]. When playing badminton, eye-hand coordination is integrated, with the eyes serving as the primary function holder's sense of stimulation. The function holder's hand displays the movement made by the hand in response [6]. The cerebral cortex processes information from environmental cues that is conveyed to the nerve system [3]. This information then prompts the hand muscles to execute the most appropriate movement at the most appropriate moment. For everyday

* Corresponding author: Aditi Nilesh Tikle

tasks like eating and dressing, older people need to have sufficient hand-eye coordination [3]. Given that one of the essential components of physical ability in older persons is hand-eye coordination.

The ability to maintain control over a specific body position while doing a task with the least amount of postural deviation is known as balance. Three categories can impaired be used to categories equilibrium for badminton players. Holding a posture, postural adjustment to deliberate motions and response to outside pressures [7]. It is one of the most crucial physical attributes—one that pros tend to overlook—but it is essential for playing badminton at your best[7]. Playing badminton with balance puts elderly players at serious danger of falling and suffering serious injuries. [7]

2. Material and method

Between September to March 2024, convenient samples of Geriatric badminton players were recruited from Poona district metropolitan badminton association, LSBI badminton arena and other local badminton academy. All individual were screened based on the inclusion criteria and exclusion criteria. The study began after obtaining ethical clearance from the committee. Written consent was taken from all the participants. The assessment was conducted in the badminton court. Participants were asked to provide necessary information and medical history, if present. Badminton training of each participant including numbers of years of experience, hand dominance. After collecting all the basic demographic data the players underwent ruler drop test, use to provide insights into their cognitive processing speed. The primary aim of the ruler drop test is to assess a person's reaction time, which is the time it takes for them to respond to a stimulus. Reaction time is an important cognitive function and can be influenced by various factors such as age, fatigue, level of alertness, and neurological conditions. By measuring reaction time, the test can provide valuable insights into a person's cognitive function. The Dynamic Gait Index aims to assess a person's ability to perform various walking tasks that involve changes in direction, speed, and head movements, which are crucial for navigating real-world environments. The test consists of tasks such as eight walking tasks, including walking at different speeds, turning, walking over and around obstacles, and walking with head turns. DGI is specifically designed to determine the fall rate in geriatric population.

3. Results

In March 2024 a total of 43 geriatric badminton players falling under age group of 65+ were the subject population of this study. Data has been analyzed using Master chart. Descriptive statistics was performed to analyze all the demographic and outcome variable. Person coefficient correlational test was performed to find out the association between Eye hand coordination and balance. Level of significance was set at p value < 0.05. All the players were highly trained professional.

Table 1 Demographic characteristics of the participants

Variable	MEAN ± SD
AGE (yrs.)	71.35 ± 4.99
PLAYING SINCE	36.95 ± 6.70

Table 2 Reaction time (sec)

Variable	MEAN±SD
DOMINANT HAND	1.88±0.01
NON DOMINANT HAND	0.19±0.016

Table 3 Dynamic gait index

Variable	MEAN±SD
DGI	23.20±0.8

Table 4 Association between Reaction time and DGI

Variable	P Value
Reaction time (dominant hand) and DGI	0.41
Reaction time (Non-dominant hand) and DGI	0.40

Table 4. Correlation coefficient analyses was done the analysis of the data indicates that there is no significant correlation in eye hand coordination for dominant hand ($p < 0.05$) and non-dominant hand ($p < 0.05$) using ruler drop test for reaction time and balance using DGI.

4. Discussion

A correlational study was done to assess eye hand coordination and balance in geriatric badminton players, assessed by using ruler drop test and dynamic gait index. The study included 43 geriatric badminton players, above the age group of 65 years both male and female.

Our results indicate that there is no significant correlation between eye-hand coordination and balance among geriatric badminton players. This finding challenges conventional wisdom, as previous research has often suggested a positive relationship between these two factors. However, it's essential to interpret these results within the context of our study population and methodology.

The lack of a significant correlation between eye-hand coordination and balance among geriatric badminton players challenges common assumptions regarding the interdependence of these two motor skills. One possible explanation for this unexpected finding is the multifactorial nature of balance control, which may be influenced by factors beyond eye-hand coordination, such as proprioception, vestibular function, and muscle strength. Additionally, the specific demands of badminton gameplay, characterized by rapid changes in direction and explosive movements, may require distinct motor abilities that do not necessarily correlate with traditional measures of balance.

Physiologically, there are many factors affecting the results.

Sensorimotor Integration: Eye-hand coordination primarily involves the integration of visual information with motor responses, relying on the functionality of the visual system, motor cortex, and peripheral nervous system. In contrast, balance control is a multifaceted process that encompasses inputs from various sensory modalities, including vision, proprioception, and vestibular sensation. The lack of correlation may indicate that while eye-hand coordination relies heavily on visual processing, balance control may be influenced by a broader range of sensory inputs, with less direct reliance on visual feedback. Muscle Strength and Proprioception: Balance maintenance requires coordinated muscle actions and proprioceptive feedback to adjust body position and prevent falls. While eye-hand coordination involves fine motor control of the upper extremities, balance relies on lower extremity muscle strength and proprioceptive accuracy. Geriatric individuals may experience age-related declines in muscle strength and proprioception, which could impact balance performance independently of eye-hand coordination abilities.

Central Nervous System Changes: Aging is associated with alterations in brain structure and function, including changes in white matter integrity, neural connectivity, and sensorimotor processing. These age-related neurophysiological changes may affect different aspects of motor control differently. For instance, declines in processing speed and reaction time, which are often observed with aging, may disproportionately impact eye-hand coordination tasks compared to balance tasks.

Towel K.K. et.al in year 2019 found that Amateur badminton players had superior performance accuracy in badminton serving, but not static and dynamic balance performance, agility, or eye–hand coordination, relative to healthy active controls.

So, in simple terms, geriatric also had good performance in badminton serving, but not eye hand coordination and balance. The absence of a significant correlation suggests that interventions targeting one aspect of motor function (e.g., eye-hand coordination training) may not automatically translate to improvements in balance performance among geriatric badminton players.

5. Conclusion

Our study provides valuable insights into the relationship between eye hand coordination and balance among geriatric badminton players. While we did not find a significant correlation, our finding underscores the complexity of motor skill development and functional performance in the aging population.

Future scope

Further research on other factors which might cause risk of fall other than eye hand coordination and balance in geriatric badminton players shall be studied further.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

Statement of ethical approval

The study started after obtaining the ethical clearance from ethical committee of P.E.S. Modern College of physiotherapy Pune 05. Permissions were taken from the badminton courts.

Statement of informed consent

Informed consent was taken from all the participants.

References

[1] Britannica, the Editors of Encyclopedia. Badminton. Encyclopedia Britannica, 3 Jan. 2023, https://www.britannica.com/sports/badminton. Accessed 17 February 2023.

[2] Phomsoupha M, Laffaye G. The science of badminton: game characteristics, anthropometry, physiology, visual fitness and biomechanics. Sports medicine. 2015 Apr;45:473-95.

[3] Chu HY, Chan HS, Chen MF. Effects of horticultural activities on attitudes toward aging, sense of hope and hand–eye coordination in older adults in residential care facilities. International Journal of Environmental Research and Public Health. 2021 Jun 18;18(12):6555

[4] Boss GR, Seegmiller JE. Age-related physiological changes and their clinical significance. West J Med. 1981 Dec;135(6):434-40. PMID: 7336713; PMCID: PMC1273316.

[5] Amarya, S., Singh, K., & Sabharwal, M. (2018). Ageing Process and Physiological Changes. InTech. doi: 10.5772/intechopen.76249

[6] Kasmad, M. Rachmat, and Benny Badaru. The Effect of Hand-Eye Coordination, Wrist Flexibility, and Self-Confidence on Serve Ability in Badminton on Senior High Schools Students. 3rd International Conference on Education, Science, and Technology (ICEST 2019). Atlantis Press, 2020.

[7] Chu, Hui-Ying, Hui-Shan Chan, and Mei-Fang Chen. Effects of horticultural activities on attitudes toward aging, sense of hope and hand–eye coordination in older adults in residential care facilities. International Journal of Environmental Research and Public Health 18.12 (2021): 6555.

[8] Priyadarshana, L. A. D. The Effectiveness of Calisthenics Exercise Program to Develop Balance among Badminton Players. Proceedings of the 6th International Conference on Multidisciplinary Approaches (iCMA). 2019.

[9] Berg, Katherine. Balance and its measure in the elderly: a review. Physiotherapy Canada 41.5 (1989): 240-246