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Correlation Between Eye–Hand Coordination And Reaction Time In Geriatric Population: A Cross-Sectional Study

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Abstract

Background: Age-related declines in sensory, motor, and cognitive domains adversely affect daily functioning in older adults. Eye–hand coordination and reaction time, both vital to independence and mobility, deteriorate with aging, potentially predisposing individuals to disability, accidents, and reduced quality of life.

Aim: This study aimed to investigate the correlation between eye–hand coordination and reaction time in the geriatric population using standardized assessment tools.

Methods: A cross-sectional study was conducted among 80 community-dwelling older adults aged 60–69 years, recruited through purposive sampling. Eye–hand coordination was assessed using the Beery Visual Perception (VP) scale, whereas reaction time was measured through the Deary-Liewald Reaction Time (DLRT) task administered via the CogniFit application. Participants meeting independence and cognitive orientation criteria were included. Pearson's correlation coefficient was applied to analyze the association between the two variables using SPSS v.27.

Results: The sample included 52 males (65%) and 28 females (35%). Findings revealed that a majority of participants scored low on eye–hand coordination (74%) and exhibited slow reaction times (65%). Pearson analysis demonstrated a significant negative correlation between eye–hand coordination and reaction time ($r = -0.675$, $p < 0.001$), indicating that slower responses were associated with reduced coordination capacity.

Conclusion: The study provides evidence that age-related motor and cognitive decline jointly deteriorate eye–hand coordination and reaction time in older adults. These impairments negatively affect independence, safety, and quality of life. Incorporating physical activity, cognitive training, and early screening into geriatric health strategies may help mitigate these challenges.

Keywords: Eye–Hand Coordination; Reaction Time; Aging; Gerontology; Cognitive Decline; Psychomotor Performance

The upper limbs are essential for carrying out daily tasks, which include gross motor abilities like walking and maintaining balance as well as fine motor skills like dressing and feeding (1). The interplay between vision and proprioception is crucial for coordinated movement (2). Cognitive abilities, such as executive functioning, attention, memory, and visuospatial skills, frequently deteriorate with age, affecting upper limb performance (3)(1).

Dementia, depression, poliomyelitis, macular degeneration, Parkinson's disease, and other age-related illnesses all contribute to cognitive and motor deficits that limit independence and cause physical limitations (4). Due to decreased physical activity, sensory acuity, and loss of optic nerve fibers, eye-hand coordination, which is dependent on sensory-motor integration and the frontal lobes, deteriorates with age and frequently indicates early cognitive decline (5)(6).

Detecting and focusing on a target, recognizing and finding it, mentally planning a movement, and activating muscles to complete the job are all components of the coordination process (7). One important indicator of processing speed is reaction time, which is the amount of time between the start of a stimulus and the response. While choice reaction time (300–600 ms) entails choosing the right response from a range of alternatives, simple reaction time (150–300 ms) includes responding to a single stimulus (10)(11). As people age, their reaction times decrease down due to neurophysiological changes that impact cognitive function and the ratio of accuracy to speed (12).

Task complexity affects timing, and human reaction is shaped by sensory encoding, central processing, response selection, and motor execution (10)(9). These processes depend on a number of parameters, such as age and medication (12). Personalized cognitive evaluations and training in areas such as executive function, memory, and attention are provided via the popular digital platform Cognifit, which adaptively increases task difficulty according to individual performance (13).

Over 60% of senior citizens have motor impairments, such as poorer hand-eye coordination, and 40–60% have delayed reaction times that impair their ability to complete tasks. Reduced physical activity, sensory impairments like vision loss, and age-related brain degeneration are frequently the causes of these declines. Reaction time and eye-hand coordination are physiologically related, but little research has been done on the subject. Addressing age-related motor and cognitive decline, which can result in falls and a loss of independence, requires an understanding of this relationship. In order to enhance the quality of life

for older adults, this study intends to examine the relationship between eye-hand coordination and reaction time using the Visual Perception scale and the Cognifit app.

Method:

The Visual Perception (VP) scale and the Cognifit cognitive training app were used in this study to evaluate older adults' eye-hand coordination and reaction time. Cognitive processing speed and visual-motor integration were assessed at baseline for the participants. The Cognifit app offered personalized cognitive tests in the areas of processing, memory, and attention, while the VP scale measured visual perception skills associated with motor tasks. The app's task-based measurements were used to record reaction time. In order to investigate the relationship between eye-hand coordination and reaction time in the context of age-related motor and cognitive decline, data analysis was conducted.

A cross- sectional study was conducted at Dr. D.Y. Patil College of Physiotherapy, Pune to look into the connection between older adults' eye-hand coordination and reaction time. We recruited 80 participants between the ages of 60 and 69. A Montreal Cognitive Assessment (MoCA) score of ≥24 was used to confirm that geriatric adults of both sexes were cognitively oriented and functionally independent, and written informed consent was obtained. Exclusions included people with neurological conditions, severe visual impairments, injuries to the upper limbs or nerves, mental illnesses, or trouble following directions. The Beery Visual Perception (VP) Scale was utilized to measure visual–motor integration and eye–hand coordination, comprising 30 scoring items that took three minutes to administer, indicating high reliability (Cronbach's $\alpha = 0.94$). Reaction time was measured with the CogniFit Deary-Liewald Reaction Time (DLRT) Task, a computerized measurement of simple reaction time and choice reaction time with 0.70–0.92 reliability. The two tasks were done by participants in a distraction-free environment. Ethical clearance was approved by the Institutional Ethics Committee and written consent was procured from all participants.

RESULT:

Analysis of the data was done using SPSS version 27. Descriptive statistics such as mean, standard deviation, frequencies, and percentages were employed in summarizing demographic data and performance results. The correlation between Visual Perception (VP) scores, indicative of eye–hand coordination, and reaction time (simple and choice) was determined using Pearson's correlation coefficient, where statistical significance was $p < 0.05$.

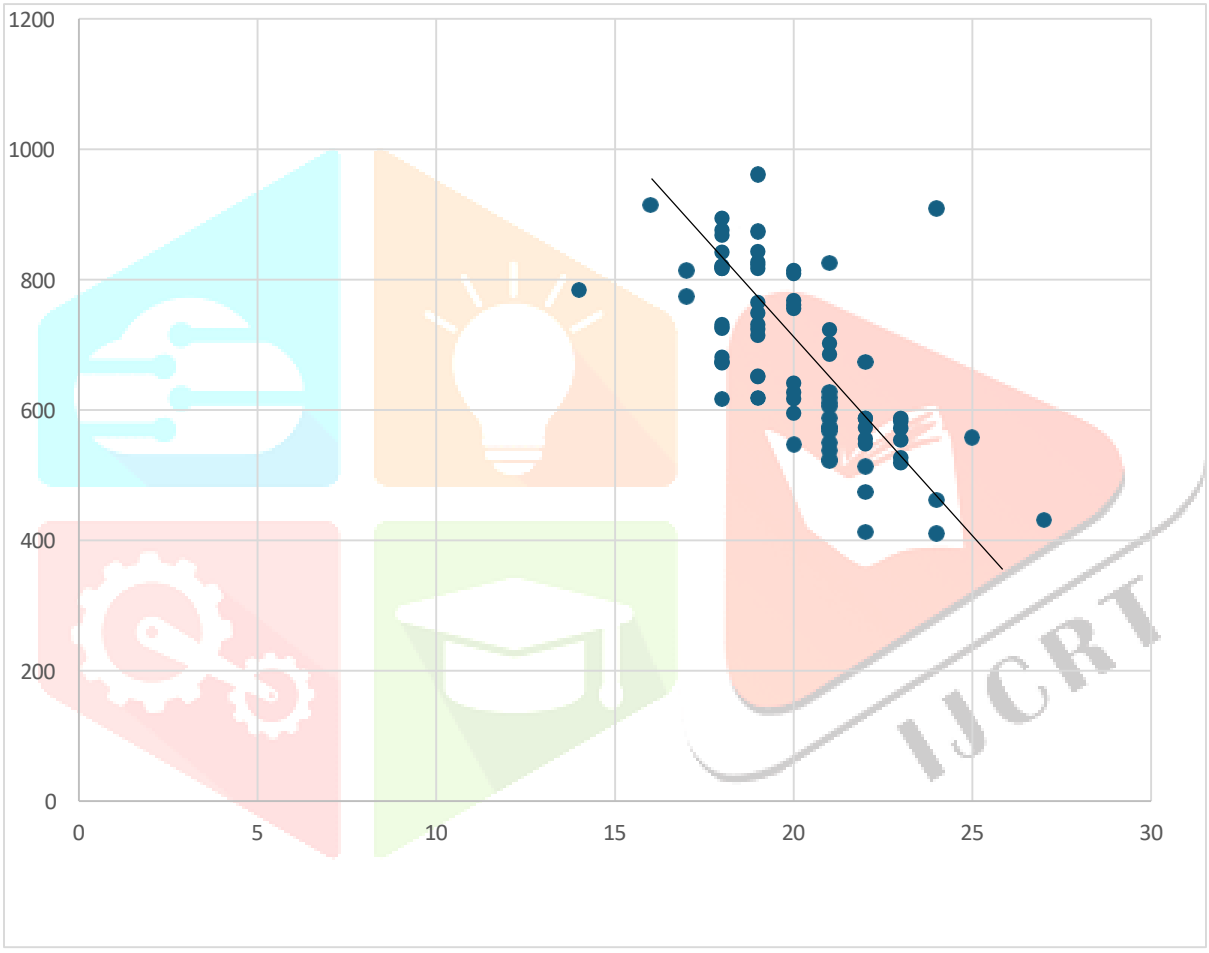
Out of 80 participants, 52 (65%) were male and 28 (35%) were female. Under eye–hand coordination, 42.5% showed very poor scores, 31.25% had poor scores, 16.25% were at a below-average level, and only 10% scored within the average range. For reaction time, 35% of the participants scored at the average level, while 65% were slow. Pearson's correlation test revealed a strong negative correlation ($r = -0.675$,

$p < 0.001$) between reaction time and eye–hand coordination that showed slower reaction times were strongly associated with worse coordination in this group.

Tables and Graph:

Correlation	Score
Pearson Correlation (r)	-0.675

Table1: Correlation of Eye hand coordination and Reaction Time



Graph 1: Shows that there is a significant correlation between eye hand coordination and reaction time.

DISCUSSION:

The findings of this study show a high rate of motor impairment and delayed reaction time among older adults. This agrees with earlier studies that found over 60% of the elderly population has some form of motor dysfunction, which includes issues with eye-hand coordination (1). Most participants displayed either very low or low coordination, and 65% had slower than average reaction times. These declines are strongly linked to age-related brain changes, vision loss, and reduced physical activity (2). Slower reaction times have been connected to declines in cognitive functions like attention, working memory, and processing speed (3)(1). The significant negative correlation ($r = -0.675$, $p < 0.001$) found between eye-hand coordination and reaction time in this study supports the connection between these areas and aligns with research showing that sensory processing and motor output are impacted by cortical thinning and sensory decline (5)(6). This relationship highlights the need for regular assessment and focused strategies to maintain motor skills and independence in daily activities for older adults. Recent studies stress that evaluating both visual-motor integration and reaction speed offers valuable insights into age-related functional decline. Using validated tools like the VP scale and CogniFit app can help shape effective intervention strategies (13). Improving eye-hand coordination and cognitive reaction times may lower the risk of falls and enhance quality of life, which is vital in geriatric rehabilitation and preventive care (4)(5).

CONCLUSION:

The study shows that eye-hand coordination significantly decreases as reaction time delays in older individuals. There is a strong negative correlation ($r = -0.675$). This finding confirms the link between cognitive and motor functions in the elderly. By tackling these declines with preventive screening, regular physical activity, and focused neurocognitive training, it is possible to greatly improve safety, maintain independence, and improve overall quality of life for older adults