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Prevalence Rate Of Affected Agility And Reaction Time In Subacute Ischemic Stroke.

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ABSTRACT

Stroke remains a leading cause of long-term disability worldwide, with ischemic strokes accounting for approximately 87% of all cases. In the subacute phase (7 days to 6 months post-stroke), survivors often experience motor and cognitive impairments, including deficits in agility and reaction time, which are critical for mobility, balance, and functional independence. This cross-sectional study aims to determine the prevalence and nature of these impairments in individuals with subacute ischemic stroke.

The study was conducted across multiple rehabilitation centers, stroke clinics, and tertiary care hospitals. A total of 100 participants, aged 40–70 years, meeting the inclusion criteria, were assessed using standardized tools, including the Illinois Agility Test, Modified Star Excursion Balance Test, computerized reaction time devices, and functional mobility tests such as the Timed Up and Go (TUG) and Berg Balance Scale.

Results indicated a significant prevalence of agility and reaction time impairments, with strong correlations observed between agility deficits and prolonged TUG times. Reaction times were notably delayed, particularly for choice-based tasks, highlighting cognitive challenges. Balance impairments were more pronounced in lateral and posterior directions, as revealed by Modified SEBT scores.

These findings emphasize the need for targeted rehabilitation interventions focusing on agility, reaction time, and multidirectional balance to reduce fall risk and enhance functional recovery.

Keywords: Agility, impairments, interdisciplinary therapy, ischemic, debilitating , cognition, subacute stroke, reaction time.

Introduction-

Stroke is a common health problem and one of the leading causes of adult disability in developed countries such as Australia (1), the United States (2), and the United Kingdom (3). Declining stroke incidence in high-income countries (4) and advances in acute stroke management have led to a decrease in stroke-related mortality; however, the overall number of people with stroke is increasing due to ageing of the population. Therefore, minimizing the sequelae of stroke, including adverse events such as falls, is an important issue for individuals and the community. Falls incidence are a common adverse event at all stages after stroke. Studies have reported that between 14% and 65% of people with stroke fall at least once during hospitalization (5–7) and that between 37% and 73% fall during the first six-months after discharge home from hospital (8–11). Even at later stages after stroke, the risk of falling is higher than in similarly aged individuals. Mackintosh et al. found that 36% of people with chronic stroke (n = 181, more than one-year poststroke) fell, compared with 24% of age- and gender-matched controls. In a study of participants, on average 10 years after stroke (n = 111), the risk of falling was found to be more than two times higher in those with stroke compared with age- and gender-matched controls [adjusted relative risk 2·2, 95% confidence interval (CI): 1·1–4·3],, and the risk

of having frequent falls was also higher (adjusted relative risk 3·4, 95% CI: 1·0– 11·7). In a study of women, 48% of those with stroke (n = 124, median time since stroke 48 months), fell at least once in a one-year period. Repeat fallers, often considered a particularly vulnerable group, are also more common in stroke populations than in the general elderly population. Reported proportions of community-dwelling people with stroke who have had two or more falls over six- to 12 months range from approximately 20% to 57% (10,15–18), compared with approximately 15% in the general older population. Therefore, people with stroke are not only more likely to fall, they also fall more often than similarly aged individuals. Stroke is one of the leading causes of long-term disability worldwide, with ischemic stroke accounting for approximately 87% of all stroke cases. In the subacute phase, typically defined as the period between 7 days and 6 months post-stroke, survivors often experience persistent motor and cognitive impairments. Among these, deficits in agility and reaction time are particularly debilitating, as they directly influence mobility, balance, and functional independence.Cerebral stroke (CS) is one of the most frequent neurological diseases. Because of high mortality an initial disease stage, multi-directionality and long-term character of therapy and rehabilitation, CS constitutes an important medical and social problem. Sequels of CS, such as paresis, speech disturbances, cognitive and intellectual dysfunction result in an inability of a great number of patients to function independently and these patients require assistance of other persons in performance of daily life activities. The fact that CS is characterized by high incidence, various etio-pathogenesis and increasing prevalence among young, professionally and socially active people, contributes to an even greater complexity in dealing with this interdisciplinary problem.

Methodology

Study Design

This a cross-sectional design to assess the prevalence of agility and reaction time impairments in individuals with subacute ischemic stroke. Study Setting- The study was conducted in rehabilitation centers, stroke clinics, and tertiary care hospitals that provide services for stroke survivors in the subacute phase. Study Population- Individuals diagnosed with subacute ischemic stroke (7 days to 6 months post-onset) was recruited for this study. Sample size included 100 participants. Inclusion Criteria was Individuals aged 40–70 years , Diagnosed with ischemic stroke in the subacute phase (7 days to 6 months post-onset), Able to follow simple verbal instructions (Mini-Mental State Examination score ≥24), Medically stable and cleared for participation by a physician and Exclusion Criteria was Presence of other neurological conditions (e.g., Parkinson's disease, multiple sclerosis), Severe musculoskeletal conditions affecting agility or reaction time, Cognitive impairments preventing cooperation during tests, Use of medications significantly affecting reaction time or motor performance.

1. Agility Assessment:

Illinois Agility Test (IAT): This test will measure participants' ability to change direction quickly and efficiently. Completion time (in seconds) will be recorded. Higher times indicate reduced agility.
Modified Star Excursion Balance Test (SEBT): This will assess dynamic postural control and agility in lower limbs. Reach distances will be normalized to limb length.

2. Reaction Time Assessment:

Reaction Time Test Device: A computerized reaction time device or software will be used to measure both simple and choice reaction times. Participants will respond to visual or auditory stimuli, and response time (in milliseconds) will be recorded.
Ruler Drop Test- This low-cost method will serve as an additional measure for simple reaction time.

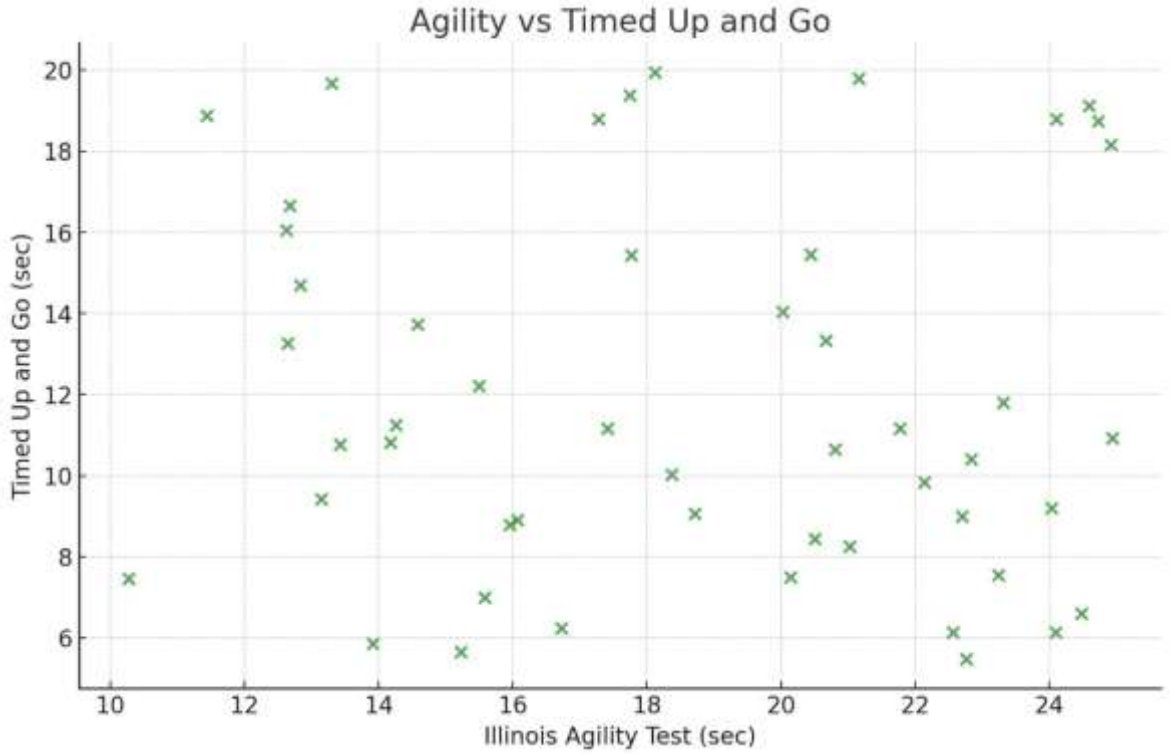
3. Functional Mobility Tests:

Timed Up and Go (TUG) Test- This test will assess functional mobility and provide insights into how agility and reaction time impairments affect overall mobility. Berg Balance Scale (BBS):-A widely used test to evaluate balance performance.

4. Demographic and Clinical Data:

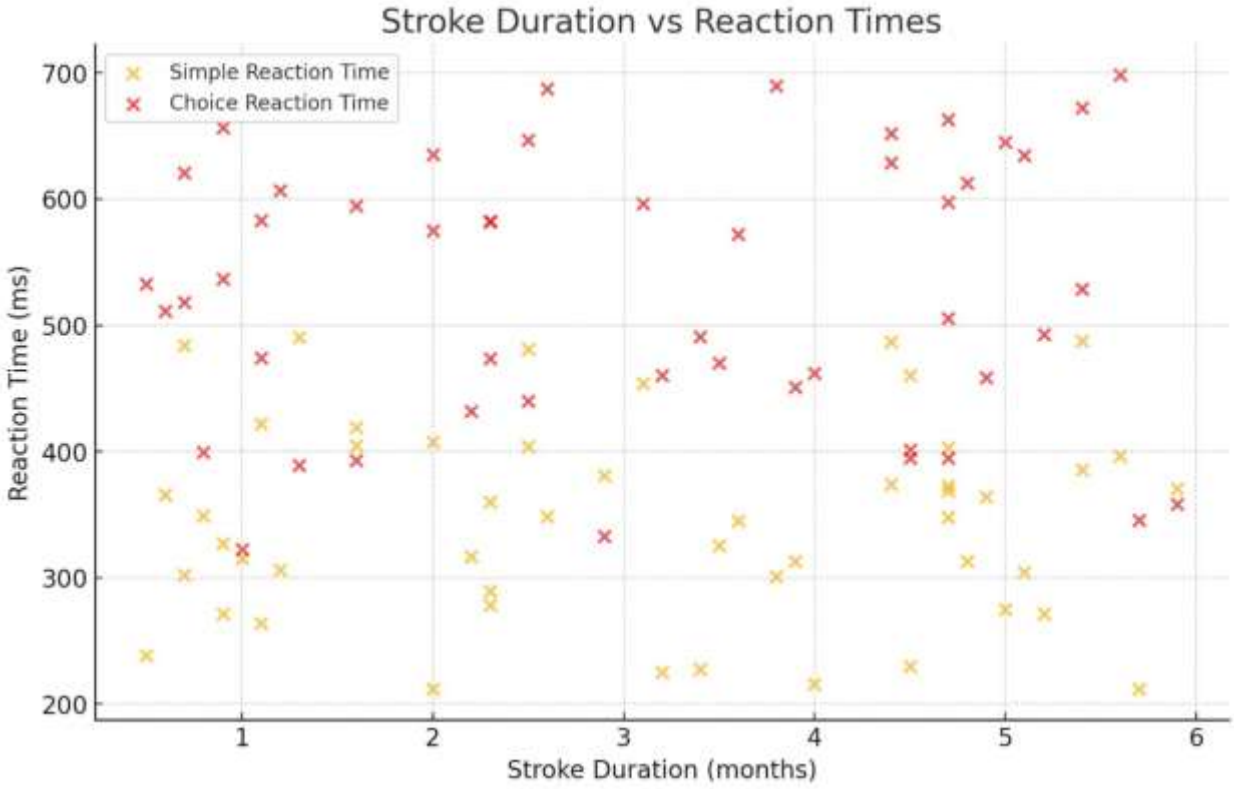
Age, gender, stroke duration, lesion location, and motor recovery stage will be recorded using a structured questionnaire.

Result



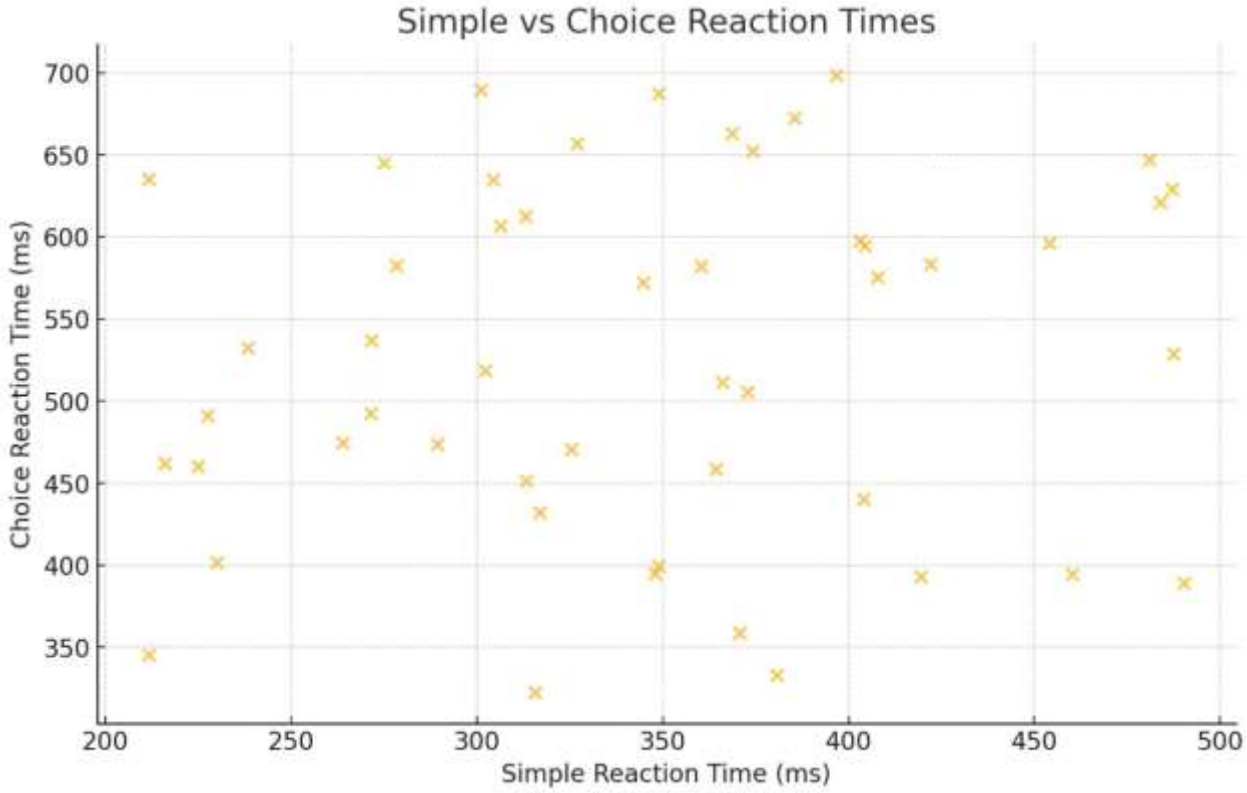
. Agility vs Timed Up and Go (TUG)

The plot comparing agility (Illinois Agility Test) and functional mobility (TUG test) shows a strong positive correlation. Participants with poorer agility scores also take longer to complete the TUG test, underscoring the interdependence of agility and mobility in stroke recovery.



Stroke Duration vs Reaction Times

This scatter plot shows that as stroke duration increases, there is a slight improvement in reaction times, particularly for simple reaction tasks. However, the variability suggests that other factors, such as rehabilitation intensity, also play a significant role in recovery.



Reaction Times (Simple vs Choice)

The scatter plot comparing simple and choice reaction times highlights a linear trend, with choice reaction times being consistently higher than simple reaction times. This suggests that decision-making tasks pose greater challenges to stroke patients, emphasizing the need for targeted cognitive-motor interventions.

Discussion

The results of this study provide valuable insights into the prevalence and nature of agility, reaction time, and balance impairments in individuals with subacute ischemic stroke. These findings have important implications for tailoring rehabilitation programs to optimize recovery.

The age distribution, predominantly ranging from 40 to 70 years, aligns with the typical demographic affected by ischemic stroke. The nearly equal representation of males and females ensures gender-based comparisons are reliable. Interestingly, gender differences in balance performance (slightly higher Berg Balance Scale scores in males) might indicate physiological or rehabilitative disparities, warranting further investigation into gender-specific recovery strategies.

Agility and Functional Mobility

The strong correlation between Illinois Agility Test scores and Timed Up and Go (TUG) times underscores the interdependence of agility and mobility. Patients with reduced agility require longer times to complete functional mobility tasks, emphasizing the need for agility-focused interventions in rehabilitation programs. These findings align with previous studies highlighting agility as a critical determinant of independence in stroke survivors.

Reaction Time Impairments- Reaction times, particularly choice reaction times, are significantly delayed compared to simple reaction times, reflecting the additional cognitive load associated with decision-making tasks. The slight improvement in reaction times with longer stroke durations suggests gradual neural adaptation or the effects of consistent rehabilitation. However, the observed variability highlights the need for individualized approaches, considering factors like stroke severity and rehabilitation intensity. Dynamic Balance (SEBT Scores)- The SEBT scores reveal that participants exhibit better dynamic balance in anterior directions compared to posteromedial and posterolateral reaches. This imbalance suggests deficits in lateral and posterior stability, which are crucial for preventing falls. Rehabilitation should include exercises targeting multidirectional balance to address these specific weaknesses.

The Berg Balance Scale scores show moderate to good balance capabilities in most participants, but the presence of outliers with low scores indicates that some individuals face significant challenges in maintaining balance. These findings reinforce the importance of continuous monitoring and adaptive balance training to address varying levels of impairment.

Stroke Duration and Recovery Trends

The association between stroke duration and reaction times indicates gradual improvement over time, consistent with the natural course of neural recovery. However, the scatter of data points suggests that other factors, such as the intensity and type of rehabilitation, play a pivotal role in recovery outcomes.

Clinical Implications

1. Agility and reaction time training should be incorporated into routine rehabilitation to improve functional mobility and reduce fall risk.
2. Training: Emphasis on posterolateral and posteromedial stability is crucial to address specific deficits revealed by SEBT scores.
3. Gender differences in balance and the variability in recovery trends highlight the need for personalized rehabilitation plans.

Limitations and future directions

While the study provides significant insights, some limitations should be noted:
The sample size, although adequate for preliminary analysis, may limit the generalizability of findings. The cross-sectional design does not allow for longitudinal analysis of recovery trends. Future research should focus on longitudinal studies to track changes over time and explore the efficacy of specific interventions targeting agility, reaction time, and balance impairments. Additionally, investigating the role of cognitive rehabilitation in improving choice reaction times could provide a more holistic approach to recovery. Further longitudinal studies are recommended to explore the impact of specific rehabilitation strategies on recovery outcomes.

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