

EFFECT OF PHYSICAL EXERCISE ON AGILITY IN YOUNG ELDERLY (65-75 YEARS)

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Abstract: Ageing leads to a progressive decline in neuromuscular, physical and cognitive functions, contributing to reduced agility, balance, and increased risk of falls. Regular physical activity plays a vital role in maintaining independence and quality of life among older adults and builds confidence among geriatric population. To study the effect of physical exercise program on improving agility among young elderly individuals aged 65–75 years. A pre-test and post-test experimental study was conducted on 49 participants aged 65–75 years. The four-week intervention consisted of five exercises — agility ladder drills, side stepping, lateral running, knee extensions, and core twists. Agility was assessed using the 8-Foot Up-and-Go Test before and after the intervention. Statistical analysis was performed using a paired t-test at a 5% significance level. The mean test score improved from 12.18 seconds (pre-exercise) to 11.20 seconds (post-exercise). The median improved from 12.4 (pre-exercise) to 11.4 (post exercise) seconds. The calculated t-value (3.641) with a p-value of 0.00068 indicated a statistically significant improvement in agility following the intervention.

The designed exercise program significantly enhanced agility among the elderly, confirming that regular physical activity improves functional mobility and reduces the risk of falls. The results support incorporating agility focused exercises into geriatric population to promote independence and well-being.

Keywords:

Agility, Elderly, Physical Exercise, Functional Mobility, Physiotherapy, Fall Prevention

INTRODUCTION

The most widely held view of ageing is that it is just a part of the life cycle. That is a progressive physiological cycle leading to senescence, or a decline of biological functions and of the bodies ability to adapt to metabolic stress. Ageing is also seen as a wide-ranging event being a physical process, a psychological one and a social one.^[3]

Ageing is a complex process that involves a decline in biological functions and is accompanied by psychological, behavioural, and others. All cells experience changes with ageing, becoming larger and less able to divide and multiply. There is an increase in pigments, and vital organs begin to lose some function as we age. Ageing changes occur in all of the body's cells, tissues, and organs, and these changes affect the functioning of all body systems. Some systems begin ageing as early as age 30, while other ageing processes are not common until much later in life. Unlike the changes of adolescence, which are predictable to within a few years, each person ages at a unique rate. Some signs of ageing can be seen from the outside, such as wrinkles and grey hair, while others are not visible. Ageing is associated with neuromuscular, cardiovascular, and central nervous system decline and has been shown to impair physical function and decrease muscle mass strength and power leading to functional limitations. The world health organisation reported that the age-related decrease in functions limits the executions of multiple tasks. [2]

Healthy and successful aging from an individual and societal perspective includes physical, cognitive, social and psychological factors. Regular physical activity reduces the risk for numerous non-communicable diseases and helps to maintain an independent lifestyle. [Available exercise training guidelines for older adults separately cover strength and balance to positively influence fall risk, endurance to positively affect cardiovascular health and flexibility to maintain mobility. Regular physical activity helps to improve physical and mental functions as well as reverse some effects of chronic disease to keep older people mobile and independent. [5]

Despite the highly publicised benefits of physical activity, an overwhelming majority of older people in the UK do not meet the minimum physical activity levels needed to maintain health. The sedentary lifestyles that predominate in older age results in premature onset of ill health, disease, and frailty. The physiological rationale for physical activity, risks of adverse events, societal and psychological factors are discussed with a view to inform public health initiatives for the relatively healthy older person as well as those with physical frailty. The evidence shows that regular physical activity is safe for healthy and for frail older people and the risks of developing major cardiovascular and metabolic diseases, obesity, falls, cognitive impairments, osteoporosis and muscular weakness are decreased by regularly completing activities ranging from low intensity walking through to more vigorous sports and resistance exercises. [9]

Yet, participation in physical activities remains low amongst older adults, particularly those living in less affluent areas. Older people may be encouraged to increase their activities if influenced by clinicians, family, or friends, keeping costs low and enjoyment high, facilitating group-based activities and raising self-efficacy for exercise. [10]

Being active while aging can optimize opportunities to improve physical, social, and mental health, enabling older people to participate actively in society. Older adults should be paid attention to because of the consequences of aging. People worldwide are living longer, and life expectancy is greater than 70 years for the first time in history. The number of individuals aged 60 years or older is increasing rapidly, and the health of these populations is usually poor. Aging impairs physical functions, mental capacity, and social interactions as a direct result of diseases or syndromes. Agility is defined as the ability to rapidly and smoothly initiate, stop, or modify movements while maintaining postural control. Agility in young people is assessed in order to play sports but in elderly it is assessed in order to prevent risk of falls and injury. That agility training is given to adults. Decrease in physical function may lead to falls, fractures, less access to health care, depression, and poor quality of life. Agility is crucial to prevent falls and maintain independence in older people. Sheppard and Young, reported that agility involved "whole-body movements in different directions in response to a stimulus." [9] Most studies evaluate agility in high-performance athletes, although a few studies assess this parameter in older adults. Agility training for older people comprises preplanned gait adaptability training and reaction training. [11]

Agility training improved postural stability, balance, and balance confidence, and decreased the risk of falls in older people. Moreover, this type of training is integrative and improves cognitive functions (e.g., perception, mental flexibility, and working memory) as well as neuromuscular and cardiovascular functions. [3] Agility training in older adults in an underrated exercise program. Training agility will lower the chances of falls. It will also improve your balance and strengthen the body to improve their ability to move rapidly without any risk of falls. Agility training involves a range of exercises designed to improve your ability to change directions during movement. [5]

Agility training (AT) is used to improve neuromuscular performance & dynamic balance, which are crucial for the physical function of older adults. Activities of daily living, which decrease with age, involve tasks simultaneously requiring motor & cognitive abilities, can be considered dual tasks. Agility training is an underrated form of exercise for older people. The idea that over 50s may need to change direction at speed is often scoffed at. Still, agility training has many real-world uses for people of any age. [11]

Agility is often associated with drills such as running through weave poles and turning around at high speeds. But this is just one example of an agility drill. The purpose of agility training is to get you moving quickly and efficiently. An agile person will have good coordination, balance, speed, and strength. They will also have good dynamic and static balance. Dynamic balance is the ability to stay balanced while moving. Static balance is the ability to stay balanced while standing still. Improving these skills is

highly beneficial. Improved balance while moving means less risk of falling; improved coordination is crucial as coordination declines as we age. Speed and strength are also critical, as they give us more independence in later life. In addition, having the ability to perform a change of direction at speed is excellent for avoiding dangerous situations. [12]

Improved agility gives you a better chance of competing in competitive sports, too. Older people are frequently encouraged to participate in group sports, not just bowls and golf. Walking football, touch rugby, and hybrid tennis sports such as pickleball have all been developed with an eye on capturing an older audience and increasing activity levels in seniors. Agility is one of the most straightforward skills to improve with training. Agility is lost by many older adults, typically because they aren't as involved in sports and activities that challenge their quickness, like sports. To actually stay steady on your feet and catch yourself, you need to be able to move quickly. By practicing agility exercise, designed for seniors specifically, you can greatly reduce the risk of falling. [13]

Ageing affects almost all parts of your body, the colour of your hair, your teeth, your heart, skin, kidneys and pretty much all the bones in your body. It is every senior's dream to age gracefully and healthy. For that to happen, doctors would recommend good nutrition, enough sleep, zero stress and no smoking or drinking, and advice that you exercise daily. [13]

Agility and balance become more crucial with ageing. Regular exercise is essential for older individuals' physical and mental health. This post covers six simple and safe agility and balancing exercises for seniors. [14] Agility training offers numerous advantages for seniors, including:

Improved Balance: Enhancing balance reduces the risk of falls, which is a significant concern for older adults. Studies have shown that regular agility training can decrease fall-related injuries, allowing seniors to maintain their independence.

Increased Coordination: Better coordination aids in performing everyday tasks more efficiently. Activities such as walking, climbing stairs, or even simple household chores become easier and safer.

Boosted Confidence: Improved physical capabilities can lead to greater confidence in mobility and independence. Seniors who feel stable and agile are more likely to engage in social and physical activities.

Social Interaction: Participating in group training sessions fosters social connections and community engagement, which are vital for emotional health and well-being.

Overall Health Improvement: Agility training contributes to better cardiovascular health, muscle strength & flexibility, all of which are essential for maintaining active lifestyle. [15]

NEED OF THE STUDY:

The purpose of this study is to evaluate the effect of exercise program like walking, side stepping, knee extensions core twist and agility ladder in improving functional mobility among geriatric population of 65 to 75 old.

To improve the ability of muscles or group of muscles to work together to perform task or functional activity. To improve muscle activity characteristic during voluntary movement.

Population And Sample

Sample Size: 49

Data And Sources Of Data

Study Design: Pre-test and post-test interventional study

Study Type: Interventional study

Study Settings: Community

Theoretical Framework

The purpose of this study was to see the effectiveness of physical exercise program on agility in young-elderly. The findings revealed a statistically significant improvement in the agility of participants, as measured by the "8 ft Up-and-Go" test.

The mean completion time for the group decreased from 12.18 seconds before the intervention to 11.2 seconds afterward, a result that is highly unlikely to be due to chance ($p = 0.00068$). The outcome supports the alternate hypothesis. The improvement is clinically important because improved agility is strongly associated with better functional independence and a reduced risk of falls among elders, which is a major concern in geriatric population. The exercise protocol was designed to improve lower body strength, coordination, and dynamic balance. The positive result suggested that the program effectively targeted these underlying physiological systems.

It is also important to notice that the participants result showed a realistic level of variation. While the majority of participants improved and few did not, which reflects the complex and individual nature of how people response to exercise.

Despite these positive results, the study has limitation. The most significant is the lack of a control group, which makes it more difficult to completely isolate the program effect from other potential factors. Additionally, the small sample size and short four-week duration means that the findings may not be generalisable to all elderly populations, and the long-term benefits of the program remain not measured.

Agility is a multifactor component involving balance, coordination, strength, and postural control. The exercises used were agility ladder training, side stepping, one-leg stance, chair squats, and marching at one place collectively helped in increasing lower limb muscle strength, proprioception, and dynamic stability.

Functional Relevance :Improved agility translated directly into safer and more confident movement during daily activities. Faster performance on the 8-Foot Up-and-Go test suggested better control during direction changes and transitions between sitting and standing—skills that are very essential for maintaining independent mobility and reducing fall risk, better performance on such functional agility tests correlates with low probability of falls in community-dwelling elderly.

The gender distribution was almost homogenous. The balanced gender distribution (49% male, 51% female) supports the generalised results to both genders. The small standard deviation (3.06 years) indicates homogeneity in the sample, ensures that the improvements were due to the intervention rather than age variability. Both men and women benefited equally from program, supported by the consistent reduction in mean and median post-test across genders.

Clinical Implications:The study highlights the clinical importance of simple, low-cost exercise protocols in community with geriatric population. Physical therapists can incorporate such agility-based exercises into community to maintain functional independence, delay frailty symptoms, and improve their quality of life among older adults. The program feasibility and safety also make it suitable for unsupervised home-based use after initial guidance. The 49 participants were included in this research who fulfilled the inclusion and exclusion criteria with consent. The administration of protocol was done and the pre and post assessment was done using 8 foot up and go test to look for the improvement.

RESEARCH METHODOLOGY

The 49 participants were taken for this study in community settings. Ethical clearance was taken from institution ethical committee. Procedure was explained to the subject. Consent was taken from the subject. 49 subjects were investigated between 65 to 75 years of age. None of the subjects had serious illness when given exercise trial. The duration of intervention was 4 weeks. The set of five exercises are selected which are Agility ladder training, side stepping, lateral running, knee extensions, core twist. The durations and repetitions of exercise were for one leg stance 10 reps 3 sets, side stepping 10 both directions 3 sets, core twist for 3 to 4 sets, marching at same place 10 reps each leg 5 sets and agility ladder exercises for 12 to 20 mins 2 to 3 times each week. 4 sets of agility ladder exercise in which subject has to do the exercise for 30 secs then relax for 15 secs.

Pre assessment and post assessment done using 8 foot up and go test before and after implementation of protocol. Data obtained was statistically analysed. The data analysed showed significant improvement among the individual. The materials required was

cone , chair , stopwatch and agility ladder .inclusion criteria was young elderly age group (65-75).Both Genders (Male and Female)and subjects who are willing to participate in the process. Eclusion criteria was any cardiological and neurological deficit and certain ortho conditions were also excluded if it was hindering the process.

DATA ANALYSIS & RESULT:

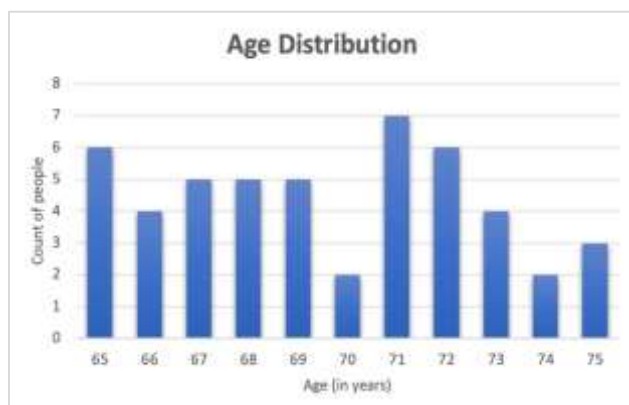
A total of 49 participants aged between 65 to 75 years were included in the study. The study population comprised both males and females who were able to ambulate independently and met the inclusion criteria. All participants successfully completed the 4-week balance exercise training protocol, and no dropouts were reported. Descriptive statistics was done for age, frequency distribution for gender, and hypothesis t-value test was used to compare the pre and post scores as the data was non-normally distributed.

Descriptive Statistics:

Age Distribution:

	Years
Mean	69.55
Median	69
Mode	71
Std Dev	3.06
Minimum	65
Maximum	75

Graph 1 : Bar diagram for age distribution of participants:

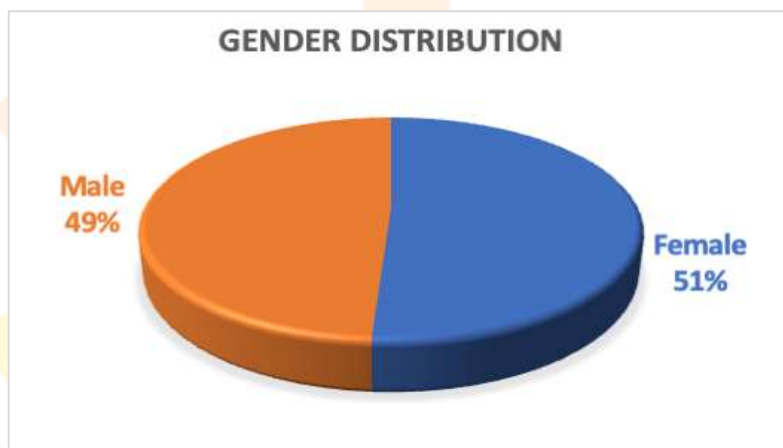


The participants in the study were aged between 65 and 75 years, with a mean age of 69.55 years and a median age of 69 years, indicating that most participants were around 69 years old. The mode of 71 further supports that 69-71 was the most frequent age among the study group. The standard deviation (SD) of 3.06 reflects a fairly homogeneous age distribution with minimal variation, suggesting that the sample was well-balanced within the defined “young elderly” age range.

Gender Distribution:

	Frequency	Percentage
Male	24	48.98%
Female	25	51.02%

Pie Chart showing Age Distribution:



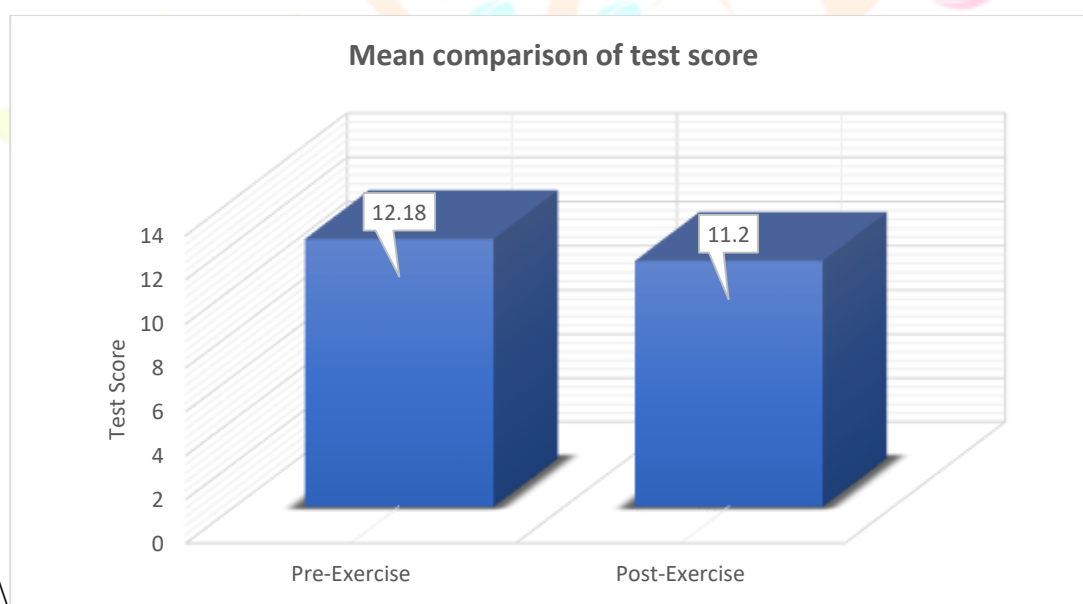
INTERPRETATION :

Out of the total 49 participants, 24 were males (49%) and 25 were females (51%), showing a balanced proportion of male and female participants in the study. This balanced inclusion of both genders ensures generalizability of the results across older adults.

8Ft Up and Go Test Score:

	Pre-Exercise	Post-Exercise
N (Sample Size)	49	49
Mean	12.18 (x_1)	11.2 (x_2)
Median	12.4	11.4
Std Dev	1.63 (s_1)	1.52 (s_2)

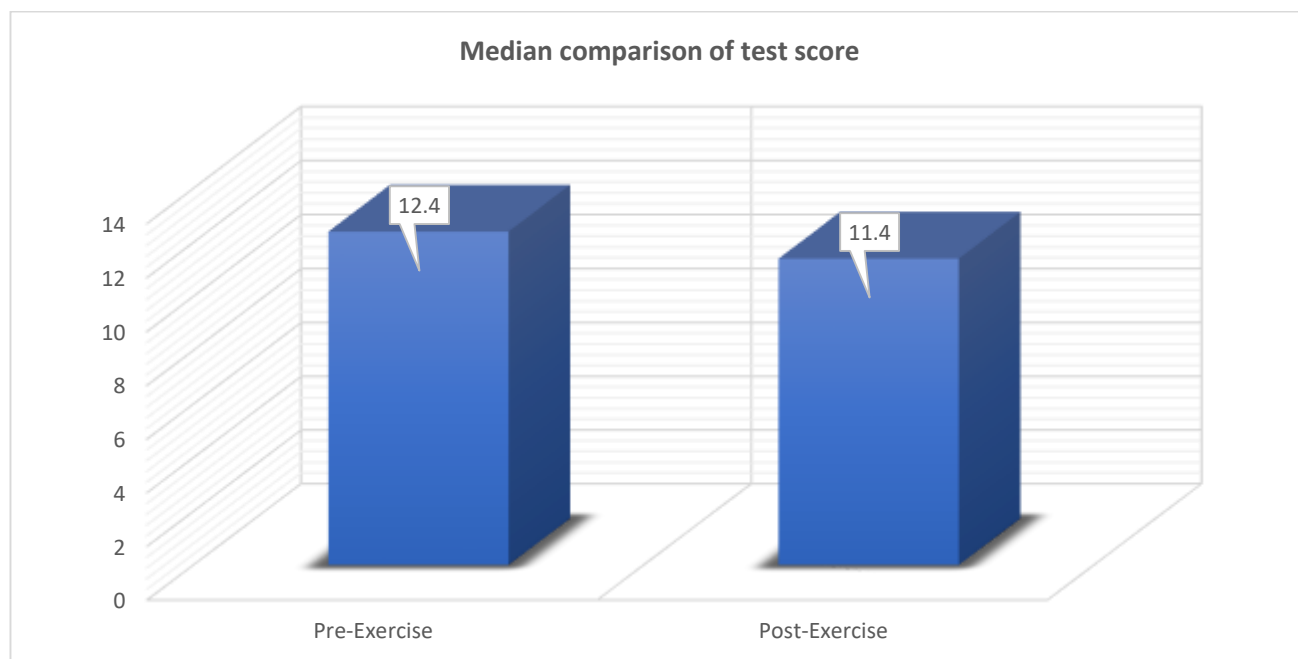
Graph 2: Bar Diagram Showing Mean Difference Between Pre And Post Exercise



INTERPRETATION:

The mean pre-intervention test score was 12.18 seconds, which improved to 11.2 seconds post-intervention, indicating a reduction in the time taken to complete the test after the exercise program.

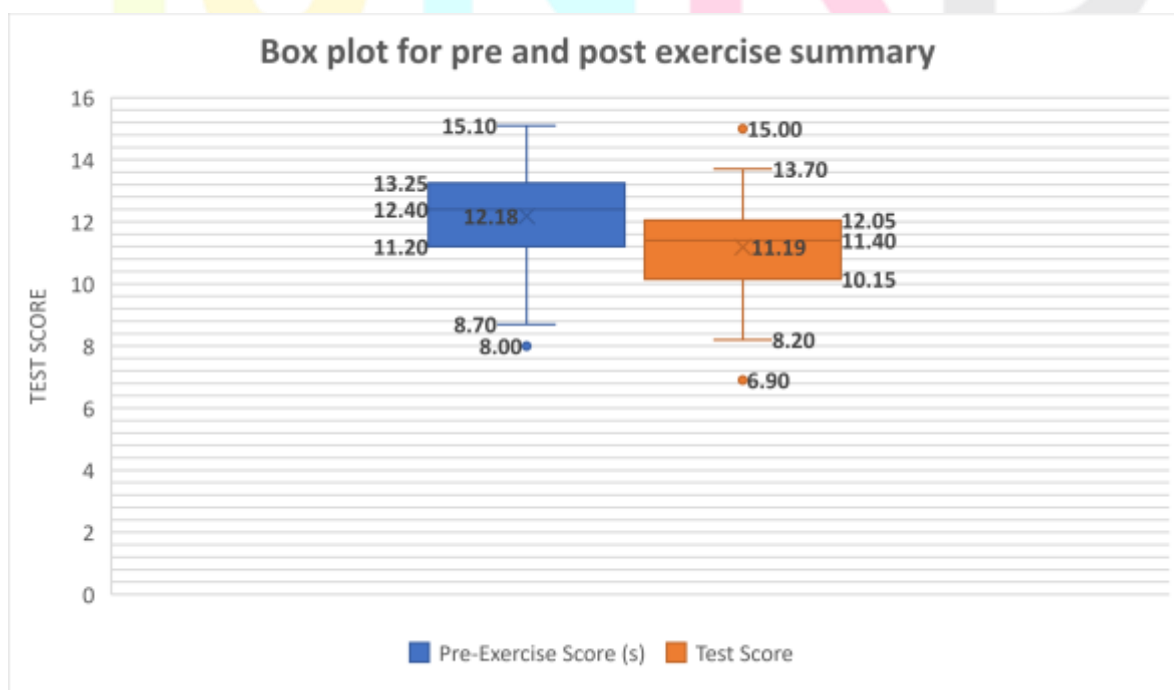
Graph 3: Bar Diagram Median Difference Between Pre And Post Exercise:



INTERPRETATION:

The median decreased from 12.4 to 11.4 seconds, showing consistent improvement across participants. The standard deviations (1.63 pre and 1.52 post) indicate similar variability before and after intervention, meaning the exercise program benefited participants relatively uniformly.

Graph 4. Box Plot For Pre Intervention And Post Intervention Summary:



INTERPRETATION:

Following the intervention, a clear downward shift in scores is visible. While the post-exercise median and mean improved, the Inter Quartile Range (25th percentile to 75th percentile) representing the central 50% of participants also shifted lower, the range shifting from 11.2-13.25 to 10.15-12.05 seconds. This indicates that the majority of participants not only improved, but the central grouping of scores also became better. The overall range also improved, with the minimum score decreasing to 6.90 seconds from 8 seconds and the maximum decreasing to 15 seconds from 15.1 seconds. This visual shift strongly suggests the exercise program was effective across the entire range of participants.

Hypothesis Testing:

1. Hypothesis

Null hypothesis (H₀): There is no significant difference in the meantime of 8ft up and go test before and after doing exercise.

Alternate hypothesis (H₁): The mean time of 8ft up and go test improved after completing the exercises.

Test Used

The test used was a one tailed paired t-test, with the significance level (α) to be 5%.

Decision Criteria:

- If the p-value < 0.05, reject H₀ and conclude that the physio exercises significantly improved performance (lower times).
- If p-value ≥ 0.05, fail to reject H₀ (no statistically significant evidence of improvement).

1. Testing Result

$$t - \text{value} = \frac{(x_1 - x_2)}{\sqrt{\frac{s_1^2 + s_2^2}{n}}}$$

Degrees of freedom (df) = n-1 = 48

p-value = 0.00068 < 0.05 (significance level)

	t-value	p-value
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Critical value	1.677	0.05
Calculated value	3.641	0.00068

The test produced a t-value of 3.641, with an associated p-value of 0.00068 (< 0.05).

Since p-value comes out to be less than 5%, we reject the null hypothesis and accept the alternate hypothesis that there is a significant improvement in 8ft up and go test score after completing exercises.

This result provides strong statistical evidence that the improvements seen in the graphs are a direct result of the intervention and not due to random chance. Therefore, it confirms that the 4-week exercise program was highly effective in significantly enhancing the agility and functional mobility of the participants.

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