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Effectiveness of a Combined Balance Training Program on Fall Prevention and Balance in Young Elderly Individuals: An Experimental Study

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Abstract:

- ***Background and Objectives:***
  A fall is an incidence which is highly injurious to an elderly person which may cause varied conditions such as soft tissue injuries or fractures. Balance is a component which is maintains a person's position such that which avoids falls and prevents injury. Hence the objective of the present study was to check the efficacy of the combined balance protocol on young elderly individuals.

- ***Methodology:***
  58 participants were included in the study and their pre and post assessments of Falls efficacy scale and timed up and go tests were taken.

- ***Results:***
  After Data analysis the results were highly significant for both falls efficacy and timed up and go tests.

- ***Conclusion:***
  The Combined balance training protocol is highly effective in falls prevention and balance enhancement of young elderly individuals.

Keywords: *Falls Prevention, Combined Balance Training, Young Elderly Individuals.*

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I. INTRODUCTION

Geriatrics is a specialized medical discipline primarily concerned with addressing health-related issues that affect the aging population, encompassing the various comorbidities and age-associated changes in the systemic structure and functioning the human of body. This population is often categorized into three distinct groups: Young Elderly individuals, aged between 65 to 75 years; Middle Elderly individuals, aged between 75 to 85 years; and Old Elderly individuals, comprising those above the age of 85 years [(1).]

A fall is operationally defined as an event where in an individual unintentionally descends to a lower position, typically coming to rest on the ground or another lower level, without the occurrence of a major intrinsic event or overwhelming hazard. Falls among the elderly demographic constitute a prevalent and serious concern, ranking as the primary cause of injury within this age group. [(2)]

Notably, the frequency of falls tends to escalate in conjunction with advancing age and frailty, with incidence rates exhibiting variability across different countries. In India, the prevalence of falls stands at approximately 14%. [(2)]

The act of falling encompasses the abrupt and inadvertent transition of an individual from their original body position to a lower position on the floor or another surface. [(3)]

Falls, indeed, represent a significant public health challenge, considerably impacting the quality of life for older adults. They often lead to a cascade of detrimental consequences, including the erosion of self-confidence, fear of recurrent falls, chronic pain, and a resultant loss of independence. Consequently, older adults are at heightened

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risk of experiencing falls, encountering issues related to balance, functional mobility, and the persistent fear of falling. [4]

Falls constitute a prevalent issue among the elderly population and can precipitate severe complications, such as hip joint fractures, resulting in elevated morbidity and mortality rates while straining healthcare resources. [3]

Evidence suggests that exercise interventions have the potential to mitigate the occurrence of falls. For instance, exercise interventions demonstrated approximately fivefold greater efficacy in reducing recurrent falls among community-dwelling older individuals in comparison to multifactorial interventions. [5]

Balance, a multifaceted motor skill, intricately involves the regulation of body posture dynamics to prevent falls. [2] It serves as a foundational element for an individual's ability to move and function independently. [6] Balance, characterized as a dynamic phenomenon, necessitates the harmonious interplay of stability and mobility. The integration of neurological and musculoskeletal systems assumes paramount importance in maintaining proper body balance. [3]

The regulation of balance serves as the foundational cornerstone underpinning self-directed ambulation and overall functional capacity. It constitutes a skill that is finely tailored to the demands of the specific task at hand, encompassing a complex orchestration of multiple joint and limb articulations. The mastery of this skill relies intricately on the harmonious interaction among diverse sensory systems, all rooted in physiological mechanisms. [13]

Within the aging demographic, the incidence of balance-related challenges experiences a notable upsurge. This demographic shift is concurrent with an increased vulnerability to the erosion of balance control and the subsequent heightened risk of experiencing falls. Previous investigations carried out in this context have provided compelling evidence in favour of a targeted approach involving the implementation of specialized balance training regimens. This approach consistently yields marked and superior enhancements in balance functionality when juxtaposed with the outcomes derived from the adoption of generic exercise regimens. [13]

Our present comprehension of balance deficits and their correlation with the propensity for falls is characterized by a notable deficiency in comprehensive and definitive elucidation. The extant scholarly corpus portrays a multifaceted terrain wherein the effectiveness of exercise interventions for fall prevention is a subject riddled with contrasting discoveries. Furthermore, the efficacy of preventive endeavours that incorporate balance training, especially in terms of curbing the occurrence of falls, lacks substantive corroboration. This chasm in knowledge is particularly conspicuous, chiefly within the sphere of female individuals. [14]

The attainment of an optimal state of equilibrium represents a fundamental yardstick for gauging the degree of autonomy in the geriatric population. Consequently, scholars embark on a diligent quest to meticulously investigate and elucidate the multifarious determinants that exert their sway over the intricate construct of balance. This scholarly pursuit is fundamentally rooted in the noble endeavour to augment the elderly cohort's capability for autonomous ambulation, bolster the safety quotient underpinning their everyday and physical undertakings, and duly abate the looming spectre of injury stemming from inadvertent falls. [15]

However, upon conducting a meticulous and comprehensive appraisal of the prevailing corpus of scholarship, a discernible degree of heterogeneity emerges. This variance assumes conspicuous proportions, particularly in the context of evaluating the repercussions of divergent exercise regimens on the equilibrium faculties of elderly individuals. Consequently, it becomes manifest that the efficacy of these exercise modalities in amplifying the domains of balance engenders a kaleidoscope of disparate findings that traverse the labyrinthine corridors of the extant academic landscape. [15]

As age advances, a natural consequence involves age-related changes that can compromise balance control, substantially elevating the risk of falls. [2] The aging process also exacts a toll on balance control, making impaired balance a prominent risk factor for falls among older adults. [6] Furthermore, balance-related issues contribute significantly to healthcare and social service costs due to their association with loss of self-confidence, injuries, the inability to maintain a safe environment, and dependence in basic functional activities. [7]

Walking exercise emerges as a promising strategy for population-wide fall prevention. It boasts versatility as it can be undertaken without constraints related to time, location, previous sports experience, or the presence of instructors. Moreover, walking is a universally prevalent form of exercise. [8]

In the general population of community-dwelling older adults, even those capable of walking at higher intensities than the high-risk population, a 3-month walking intervention has yielded substantial improvements in various physical and psychological functions. These enhancements encompass areas such as knee extension strength, gait velocity, and fall self-efficacy. Consequently, walking exercise exerts a positive influence on fall prevention among the general population of community-dwelling older adults.[8]

Within the realm of young elderly individuals, there exists a noteworthy probability of experiencing falls during their activities of daily living, with a prevalence rate of 14%. [2] Furthermore, age-related changes commonly result in balance loss, amplifying the susceptibility to falls among older adults. [2]

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Halvarsson et al. have meticulously formulated a multi-phased stratagem for the execution of balance-enhancing exercises, stratified into three distinct phases, namely the Basic, Moderate, and Advanced stages. This highly stratified and progressive exercise paradigm does not solely serve as a precautionary measure against the occurrence of falls but is rather a holistic preparatory regimen, engineered to empower individuals in mitigating the inherent proclivity for falls while concurrently augmenting their equilibrium faculties. (6)

In stark contrast to the conventional repertoire of balance exercises, which are conventionally prescribed for therapeutic amelioration purposes and typically furnish ephemeral benefits, the progressive protocol in question is inherently geared towards the singular objective of thwarting deconditioning. Moreover, it is expressly designed to perpetuate the zenith of performance capabilities across protracted time horizons. (6)

This integrated training regimen conspicuously introduces increasingly intricate and multifaceted elements as participants transition from one phase to the next.

In so doing, it endeavours to elevate the level of training sophistication experienced by individuals, thereby engendering a discernible amelioration in their performance prowess. The ultimate consequence of this meticulously structured protocol is the cultivation of a heightened level of performance prowess, thereby facilitating a noteworthy diminution in dependency levels among individuals, spanning their current as well as future life trajectories. (6)

II. RATIONALE OF STUDY

This study places specific emphasis on the young elderly population, aiming to design and implement a comprehensive falls prevention and balance training program tailored to their unique needs. The objective is to provide exercises that empower this demographic with an appropriate level of independence.

Halvarsson et al. have devised a multi-phased approach to balance exercises, categorized as Basic, Moderate, and Advanced phases. This approach not only serves as a preventive measure but also prepares individuals to mitigate the risk of falls and enhance their balance. In contrast to conventional balance exercises, typically administered for therapeutic purposes with short-lived effects, this progressive protocol seeks to combat deconditioning and sustain performance abilities over extended periods. The combined training protocol introduces progressively complex components to elevate individuals' training to a higher level, promoting superior performance and reduced dependency in both present and future life stages.

The adoption of a combined training protocol represents a challenging option for young elderly individuals aiming to prevent falls and improve balance. It is characterized by its categorization and progression into increasingly difficult tasks as time elapses.

This study proposes to investigate the effectiveness of exercises following the Basic, Moderate, and Advanced phases of the combined training protocol. This research aims to elucidate the significance of combined training and assess its efficacy in enhancing falls prevention and balance in young elderly individuals.

Furthermore, the enhancement of dynamic balance is crucial in the elderly population to mitigate the risk of recurrent falls. Initiating exercise interventions early in the young elderly phase holds promise for the development and improvement of balance.

While simple balance exercises have been a subject of study, there is a paucity of research examining the effects of a combined Balance training program. Hence, this present study seeks to bridge this gap by comprehensively investigating the impact of such a program on falls prevention and balance in young elderly individuals.

- *Primary Research Question*

Whether there will be the effect of combined balance training program on falls prevention and balance in young elderly individuals using Falls Efficacy Scale and Timed up and Go Test at the end of 6 weeks?

III. RESEARCH HYPOTHESIS

- *Primary Hypothesis:*

The combined balance training program will have an effect on falls prevention and balance in young elderly individuals at the end of 6 weeks.

- *Alternate Hypothesis:*

(H_1): The combined balance training program will have an effect on falls prevention in elderly over a period of 6 weeks

- *Null Hypothesis:*

($H0_1$): The combined balance training program will not have any effect on falls prevention in young elderly individuals at the end of 6 weeks.

- *Aim*

To study the Effectiveness of a Combined Balance Training Program on Fall Prevention and Balance in Young Elderly Individuals at the end of the 6^{th} weeks of intervention.

- *Objectives*

To study the Effectiveness of a Combined Balance Training Program on Fall Prevention in Young Elderly Individuals using Falls Efficacy Scale and Timed Up and Go Test.

To study the Effectiveness of a Combined Balance Training Program on Balance in Young Elderly Individuals using Falls Efficacy Scale and Timed Up and Go Test.

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IV. MATERIALS AND METHODOLOGY

- *Study Design: One Group Experimental Study.*
- *Place of Study: In and Around the City.*
- *Sampling Technique: Convenient Sampling.*
- *Study Population: Young Elderly Individuals.*
- *Study Duration: 18 Months.*
- *Sample Size: 58.*
- *Intervention Duration: 6 Weeks.*

- *Inclusion Criteria:*

- BMI – 18.5 – 29.9 kg/m^2
- Individuals with < 70 on fall efficacy scale.
- Individuals with <45 on bergs balance scale.
- Range of motion to be within normal limits.
- Manual Muscle Testing should be > grade3.
- Upper limb and Lower limb Flexibility to be screened using sit-reach test and back scratch test.

- *Exclusion Criteria:*

- Individuals who have undergone recent surgery of the abdominal, thoracic area in last one year, surgery for spinal or limb injuries in last two years, severe soft tissue injuries in last six months.
- Individuals who have cardiovascular pulmonary, neurological or musculoskeletal conditions which may interfere with participation.
- Individuals who are participants in another study.
- Individuals using assistive devices.
- Individuals who are over-weight or obese.
- Individuals who are psychologically unstable.

- *Operational Definitions*

- **Geriatrics** is a branch of medicine which deals with the health issues of the elderly population which is related to aging and comorbidities of the systemic structure and function of the human body.
- Classified into 3 groups of
- Young Elderly ranging from 65 to 75 years,
- Middle Elderly ranges from 75 to 85 years and
- Old Elderly includes all individuals above age of 85 years. (1)

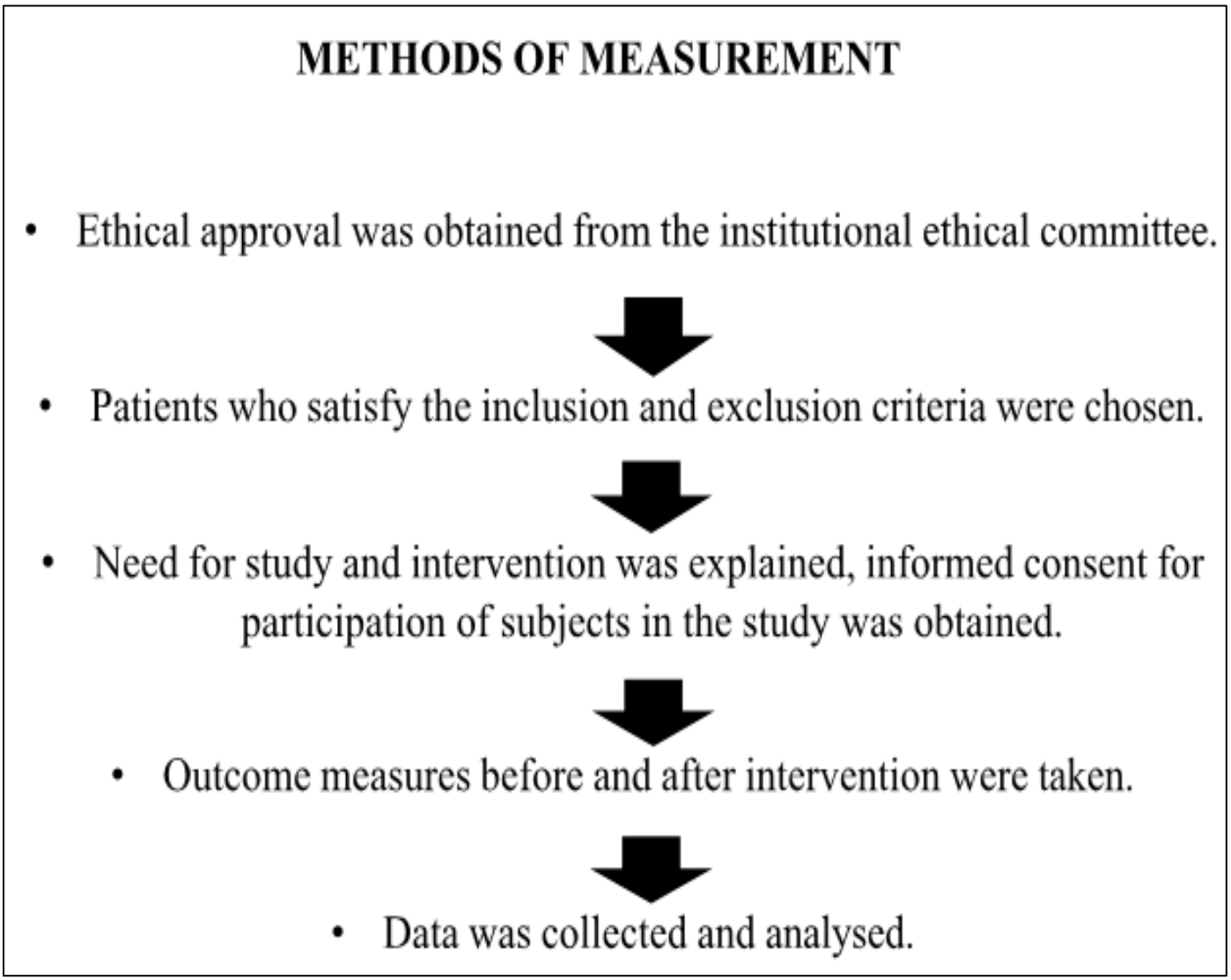

Fig 1 Methods of Measurement

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➢ *Study Instrument*

- *Falls Efficacy Scale*

ACTIVITY SCORE; 1 = VERY CONFIDENT, 10 = NOT CONFIDENT AT ALL

A total score of greater than 70 indicates that the person has a fear of falling

✓ Take a bath or shower
✓ Reach into cabinets or closets
✓ Walk around the house
✓ Prepare meals not requiring carrying heavy or hot objects
✓ Get in and out of bed
✓ Answer the door or telephone
✓ Get in and out of a chair
✓ Getting dressed and undressed
✓ Personal grooming (i.e. Washing your face)
✓ Getting on and off of the toilet.
✓ (Validity=0.98) (Reliability=0.94)

- Timed Up And Go Test

Instruction: When I say "Go," I want you to:

✓ Stand up from the chair.
✓ Walk to the line on the floor at your normal pace.
✓ Turn.
✓ Walk back to the chair at your normal pace.
✓ Sit down again.

On the word "Go," begin timing. Stop timing after patient sits back down. Record time.

An older adult who takes ≥12 seconds to complete the TUG is at risk for falling.

(Validity=.77) (Reliabity: 95%)

➢ *Data Collection Tools*

- Consent Forms (Annexure I)
- Assessment Scales
- Pens.
- Obstacles
- Foam Mat
- Step Platform

➢ *Methods of Data Collections*

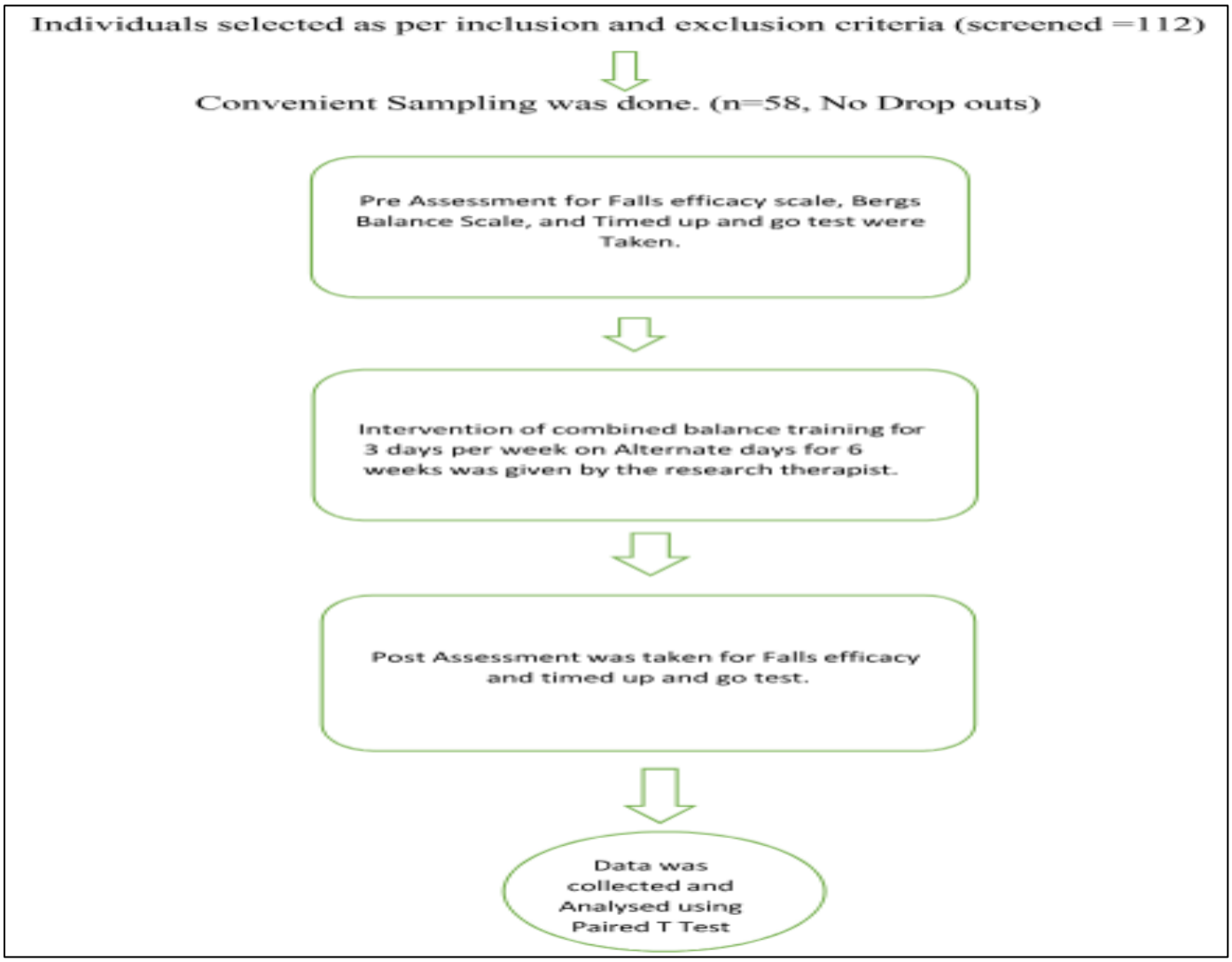

Fig 2 Method of Data Collection

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➢ *Appropriate Data Management and Analysis Procedure*

- Data analysis plan and methods:

Data was collected and entered in excel sheet for statistical analysis. Mean values for various parameters was calculated.

Pre and Post mean of falls efficacy scale and timed up and go test values analysed by SPSS Software using Paired t test.

✓ Explained intervention:

2 mins rest were provided between each exercise.

- Treatment was provided for 6 weeks alternate days of the week. In First week, day 1, day 3, day 5,
- In Second week, on day 2, day 4, day 6. In Third week, day 1, day 3, day 5,
- In Fourth week, on day 2, day 4, day 6. In Fifth week, day 1, day 3, day 5,
- In Sixth week, on day 2, day 4, day 6.

➢ *Intervention*

- Basics

✓ Walking on foam mat
✓ Walking around in a "messy" surrounding (chairs, cones, etc.)
✓ Walking forward, returning walking backwards.
✓ Tandem walking. Moderate
✓ Walking on foam mat. (cognitive task)
✓ Walking around in a "messy" surrounding (chairs, cones, etc.), reciting or counting.
✓ Walking around, doing lunges on request. (left foot when tapped on left shoulder)
✓ Walking forward, finishing with stepping up and down on step platform.

- *Advanced*

✓ Walking around buttoning and unbuttoning clothing, (reciting or counting, doing lunges on request. (left foot when tapped on left shoulder)
✓ Walking forward and returning walking backwards, adding both motor and cognitive task.
✓ Walking forward, finishing with stepping up and down on step platform, adding both motor and cognitive task.
✓ Tandem walking, adding both motor and cognitive task.

V. DATA ANALYSIS AND INTERPRETATION

➢ *Demographic Characteristics of the Study Participants (N=58)*

Table 1 Showing Age and Gender of the Individuals

Variables	Sub-groups		N	%
Gender	Male	MEAN (SD)	52	89.7
	Female		6	10.3
Age (Mean ± SD)			69.50 ± 2.735	

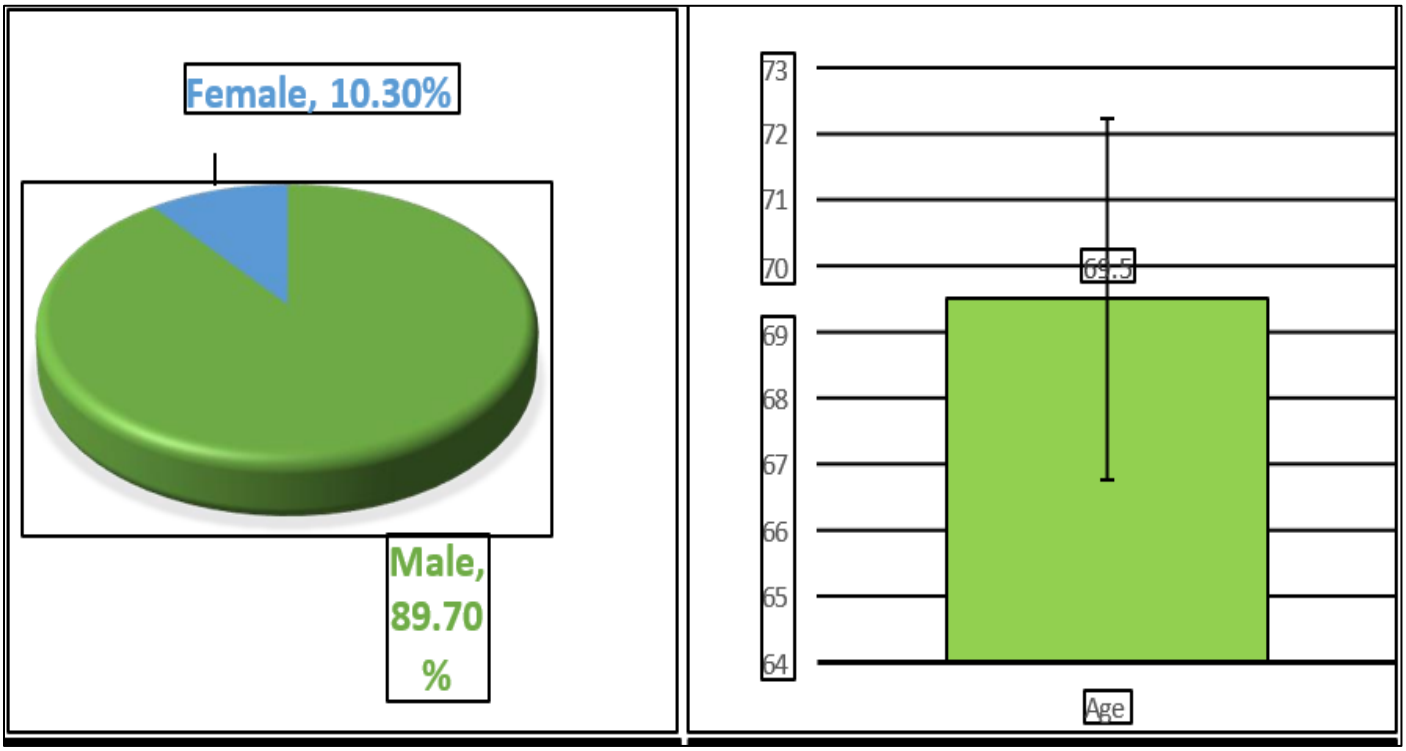

Fig 3 Graph Showing Age and Gender of the Individuals

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➢ *Interpretation*

The above table and graphs show that the study consisted of 52 males and 6 which were 89.7% and 10.3% respectively. Their mean age was 69.50±2.735 as standard deviation.

Table 2 Falls Efficacy Scale Values in Terms of {Mean (SD)} at Different Time Intervals using Paired T Test.

Time interval	N	Mean	Std. Deviation	t value	P value
Falls Efficacy Scale Pre	58	15.40	2.765	12.659	<0.001**
Falls Efficacy Scale Post	58	11.79	1.373		

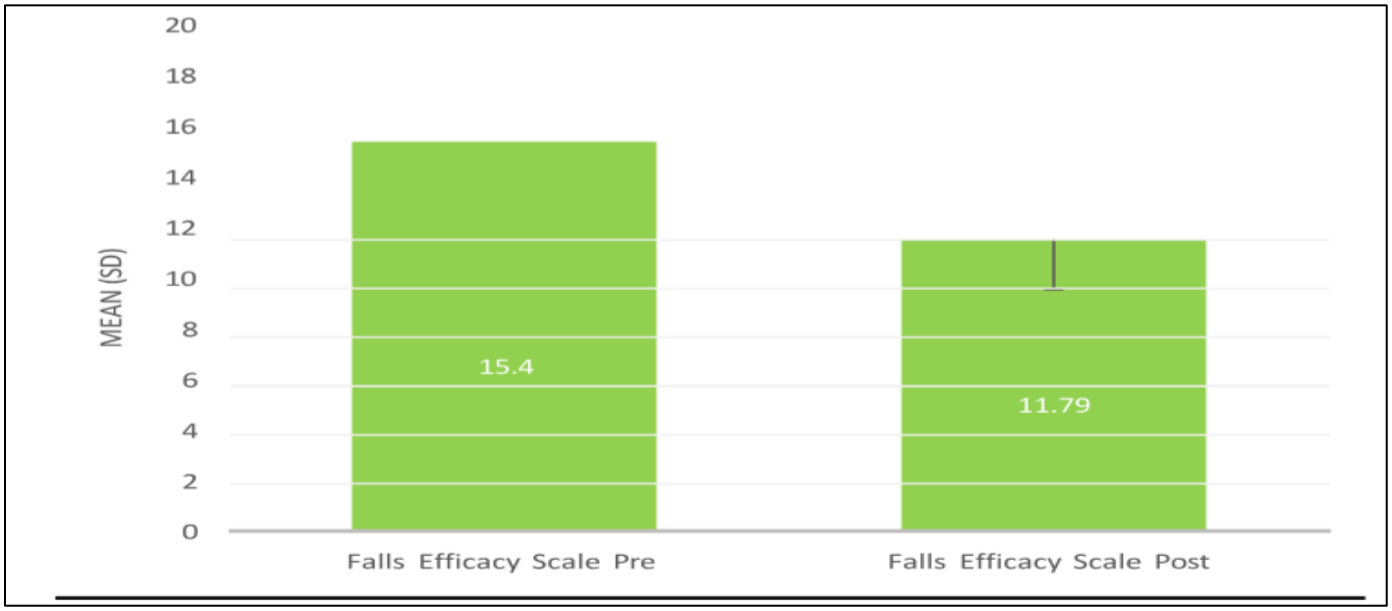

Fig 4 Graphical Representation of the Falls Efficacy Test

➢ *Interpretation*

The above table and graph show that Falls efficacy pre mean was 15.40±2.765 as standard deviation, Falls efficacy post mean 11.9±1.373 as standard deviation. P value <0.001**

Table 3 Timed Up and Go Test Scale Values in Terms of {Mean (SD)} at Different Time Intervals Using Paired T Test.

Time interval	N	Mean	Std. Deviation	t value	P value
Timed Up and Go Test Pre	58	11.76	1.467	11.737	<0.001**
Timed Up and Go Test Post	58	9.76	1.559		

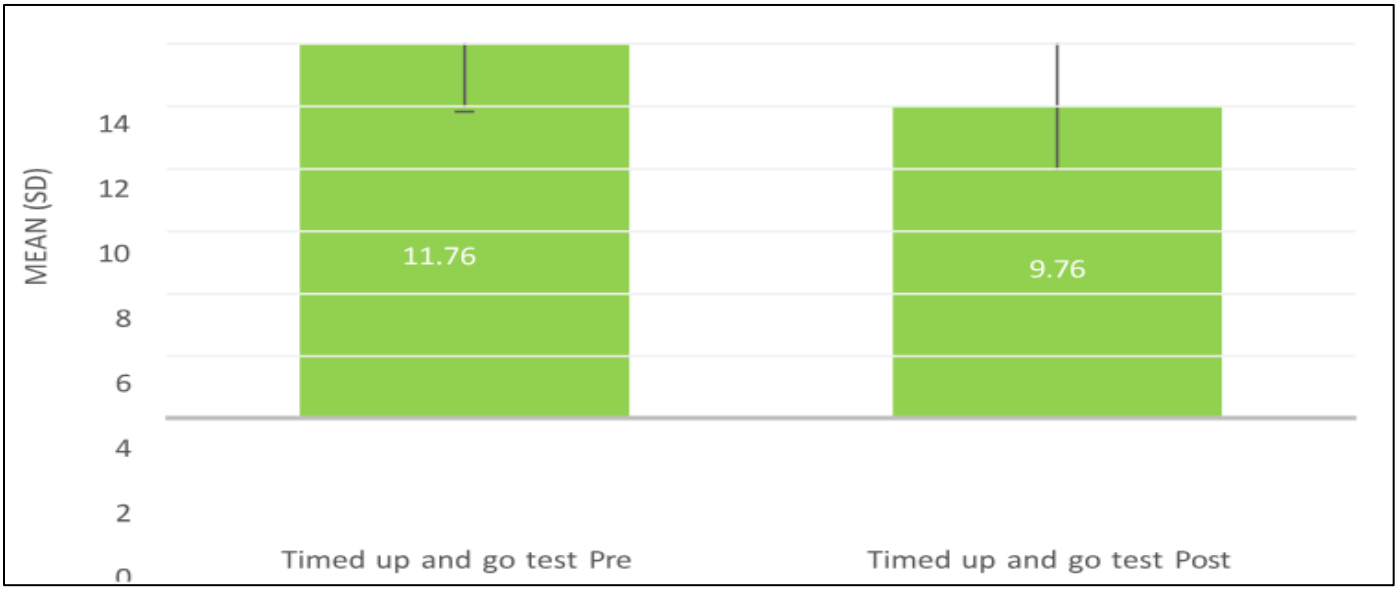

Fig 5 Graphical Representation of Timed up and go Test

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➢ *Interpretation*

The above table and graph show that timed up and go test pre – mean was 11.76 ± 1.467 as standard deviation, timed up and go test post mean 9.76 ± 1.559 as standard deviation. P value <0.001**

VI. RESULT

The demographic composition of the studied population revealed a notable gender distribution, encompassing 52 male participants (accounting for approximately 89.7%) and 6 female participants (constituting around 10.3%).

The average age, signifying the culmination of collective experience, was calculated at 69.50 years, encapsulating a standard deviation of 2.735.

As the measurements of our designated outcome variables were meticulously recorded, the pre - intervention assessment of the Falls Efficacy Scale yielded an average score of 15.40, accompanied by a standard deviation of 2.765. Subsequent to our intervention, the Falls Efficacy Scale exhibited a post- intervention mean of 11.79, harmonized with a standard deviation of 1.373. The associated statistical analysis, depicted by a t-value of 12.659 and a remarkably significant p-value of <0.001**, underscores the notable impact of our intervention on the study's outcomes.

Before the intervention, the Timed Up and Go test yielded a mean value of 11.76, accompanied by a standard deviation of 1.467. Following the intervention, there was a notable improvement, with the Timed Up and Go test demonstrating a reduced mean value of 9.76, associated with a standard deviation of 1.559.

VII. DISCUSSION

The study displayed a distinctive gender distribution, with 52 male participants (constituting approximately 89.7%) and 6 female participants (making up approximately 10.3%). The mean age of the participants, serving as a reflection of the collective age range, was precisely determined at 69.50 years, with a standard deviation of 2.735.

The meticulous recording of our designated outcome variables revealed that, prior to the intervention, the Falls Efficacy Scale yielded an average score of 15.40, accompanied by a standard deviation of 2.765. Following the intervention, the Falls Efficacy Scale exhibited a post-intervention mean of 11.79, coinciding with a standard deviation of 1.373. The ensuing statistical analysis, characterized by a t-value of 12.659 and an exceedingly significant p-value of <0.001**, serves to underscore the substantial influence of our intervention on the study's outcomes.

In the course of our investigation, we implemented a comprehensive balanced training protocol with the primary objective of assessing its impact on the improvement of balance and the prevention of falls among the elderly demographic. The rationale for this study stemmed from a recognized gap in the existing body of scientific literature. Previous research endeavours focused on balance training as a means to prevent falls have produced inconclusive findings, prompting the need for a more thorough exploration of this subject.

In response, we meticulously designed an intervention protocol that encompassed a spectrum of exercise levels, ranging from foundational to intermediate and advanced tiers. These exercises were thoughtfully curated to incorporate both straightforward and more intricate movements, as well as multifaceted exercise regimens. Notably, our protocol was further augmented by the integration of cognitive and motor components, woven into the intermediate and advanced phases of the intervention. This holistic approach was intended to provide a well- rounded training experience, recognizing the inter - connectedness of physical and cognitive aspects in maintaining balance.

To evaluate the efficacy and efficiency of the present intervention, we employed two widely recognized assessment tools: Falls Efficacy Scale and the Timed Up and Go test. These instruments were employed to quantitatively measure the intervention's impact on participants' confidence in avoiding falls and their actual performance in a timed mobility task. Through this rigorous scientific inquiry, we endeavoured to shed light on the effectiveness of our balanced training protocol as a means of enhancing balance and reducing the incidence of falls among the elderly population.

Previous scientific inquiries that have explored the experimental implementation of balance exercises or their practical applications have yielded a spectrum of outcomes, reflecting the inherent complexity and multifaceted nature of balance training interventions. This variability in results underscores the intricate interplay of physiological and bio - mechanical factors involved in balance enhancement.

The foundational principle underpinning the concept of combined balance training aligns with the introduction of an auxiliary task at an elevated level of complexity. This strategic addition serves to elevate the inherent challenge associated with the maintenance of equilibrium during the training regimen. Consequently, individuals engaging in such training protocols are required to exert a heightened level of effort and cognitive engagement to effectively sustain balance.

This deliberate augmentation of task complexity and concurrent demand for increased cognitive and physical engagement aligns with the overarching objective of facilitating habituation within the individual. Habituation, in this context, denotes the process by which the individual becomes accustomed and adaptively responsive to the multifaceted challenges introduced during balance training. Over time, this adaptive response fosters the acquisition of specialized skills and abilities, thereby contributing to the refinement and optimization of the individual's balance control mechanisms.

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The alterations made to the environmental conditions within the intervention setup, involving the introduction of both stable and unstable surfaces, along with the incorporation of upper extremity and oral tasks, can be likened to pivotal milestones in the pursuit of attaining optimal balance among the young elderly population. These modifications serve as integral components of a comprehensive strategy aimed at enhancing balance control mechanisms and, thereby, mitigating the risk of falls. (6)

These changes to the terrain, characterized by the use of both stable and unstable surfaces, mirror the dynamic challenges that individuals may encounter in their daily lives. By exposing participants to these varying surface conditions, the intervention seeks to replicate real-world scenarios that require adaptive responses to changing environmental demands. This serves as a fundamental aspect of balance training, fostering the development of versatile balance control mechanisms. (6)

The inclusion of upper extremity and oral tasks within the intervention further amplifies the complexity of the training regimen. Such tasks necessitate a multifaceted engagement of motor and cognitive functions, demanding a concerted effort from both upper limb musculature and oral motor control. These tasks are strategically integrated to elicit a holistic response from the individual, promoting the refinement of motor coordination and cognitive processing. Through these cumulative efforts, participants progressively advance toward the attainment of an appropriate and adaptive balance, effectively reducing the susceptibility to falls within the young elderly population. (6)

The introduction of varying levels of difficulty and complexity in these activities serves as a pivotal mechanism for enhancing balance control. By systematically increasing the challenge level, the intervention progressively augments the neural engrams associated with balance-related activities. This, in turn, sharpens the individual's adaptive response capabilities, effectively enhancing their overall balance. In essence, the modulation of task difficulty provides valuable insights into how the imposition of increased demands on the individual's motor and cognitive faculties contributes to the refinement and enhancement of their balance abilities. (2)

Analogous investigations done by Lesinski et al with results akin to our research have provided detailed insights. These examinations have revealed that Balance Training (BT) stands as an effective modality for enhancing various facets of balance among older adults. The improvements encompass both static and dynamic steadiness, proactive and reactive balance responses, as well as enhanced performance in comprehensive balance assessment batteries.

Moreover, our analysis allowed us to identify effective modes and protocols for implementing balance training. Consequently, we advocate for practitioners and therapists to reference the established dose-response relationships elucidated in this systematic literature review and meta-analysis.

These insights collectively underscore the significance of our findings and underscore the importance of refining our understanding of balance training's applicability, mechanisms, and optimization. This knowledge is invaluable for practitioners and therapists seeking to devise evidence-based strategies for enhancing balance performance among older adults. (11)

Additional research done by Shin et al that integrated balance training as its intervention approach yielded noteworthy findings. Specifically, this study found that motor dual-task balance training exhibited a superior effect on enhancing balance and walking proficiency when compared to simpler forms of balance training. The distinction here lies in the incorporation of concurrent motor tasks, which imposed a higher cognitive demand during the training regimen.

This divergence in training strategies raises pertinent questions and avenues for further investigation. For instance, future research initiatives should delve deeper into the intricacies of motor dual-task training. Such inquiries may involve the comprehensive analysis of kinematic and kinetic data, providing insights into the biomechanical aspects of balance enhancement. Moreover, the examination of muscle activation patterns and motor strategies warrants attention, as they may reveal critical information about how individuals adapt and coordinate their movements during dual-task scenarios.

Importantly, there exists a noteworthy parallel with our own study. The findings in this additional research align with our observations to a certain extent, as both studies underscore the efficacy of balance training in enhancing balance control and potentially preventing falls. Nevertheless, it is imperative that further investigations elucidate the specific parameters and nuances that contribute to the differential effects observed between different balance training approaches.

In essence, the existing research landscape hints at the promising potential of motor dual-task balance training, encouraging future studies to explore this avenue while considering comprehensive biomechanical, neuromuscular, and cognitive aspects. This would allow for a more holistic understanding of the interventions aimed at improving balance and reducing the risk of falls, which ultimately aligns with the goals of our study. (10)

Furthermore, an independent study Tatjana Bulat et al conducted on a cohort of elderly veterans, who were deemed at risk for falls, implemented a functional balance training program. The outcomes of this study demonstrated that this specific balance training intervention was both safe and efficacious. It effectively improved various aspects of balance in the study participants.

The observed improvements were notably significant in the context of fall prevention. This underscores the practical relevance of the study's findings, as enhanced balance is a pivotal factor in mitigating the risk of falls among elderly

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individuals. Importantly, these outcomes align closely with the results obtained in our own investigation.

The convergence of findings between these two studies serves to bolster the evidence base supporting the utility of balance training as an intervention strategy in the elderly population, particularly in those individuals at higher risk of falls. The consistency in outcomes not only reinforces the efficacy of such interventions but also highlights the transferability of these findings across diverse cohorts of elderly individuals.

In essence, the results from this additional study provide a valuable point of reference and validation for the effectiveness of functional balance training in enhancing balance and reducing the risk of falls, aligning harmoniously with the outcomes of our own research. (7)

Hence, the research conducted by our team has demonstrated its appropriateness as an effective strategy for fall prevention and balance enhancement among the cohort of young elderly individuals under investigation. The outcomes of our study substantiate its relevance and applicability in mitigating the risk of falls and promoting improved balance within this specific demographic group.

These findings underscore the practical utility and translational significance of our research endeavours. They not only contribute to the body of scientific knowledge but also hold pragmatic implications for healthcare and rehabilitation strategies tailored to address the unique needs of the young elderly population. As such, our study serves as a valuable and substantiated contribution to the field of fall prevention and balance improvement in this demographic, aligning effectively with the overarching goals of our investigation.

VIII. CONCLUSION

➢ *The Present Study Concluded That:*

- A combined balanced training program is showing improvement in balance and falls prevention by using Falls efficacy scale and timed up and go test, respectively.
- Hence, we accept the alternative hypothesis which states that A combined balanced training program is effective improving balance and falls prevention in young elderly individuals over a period of six weeks.

➢ *Clinical Implication*

Study findings are of clinical importance since they indicate and effectiveness in improving balance and preventing falls in young elderly individuals.

Combined balance training program had an effect on falls and enhancing balance in young elderly individuals.

Hence this intervention can be used as a treatment for the elderly population in balance enhancement and falls prevention.

➢ *Limitations*

More of male participants participated in the study whereas there were fewer female participants.

FUTURE SCOPE

This intervention can be used in population younger, that is, middle aged populations (40 to 50 Years/ 50 to 65 Years) or older (75 to 85 Years) in age with or without interventional alterations such that it may help in observing its effects.

Also, a future reassessment of the individuals available in the present study can show us how much preparatory preventive effect it had on balance and falls.

If the intervention is used for specific needs, then it may also be helpful for measuring other parameters such as skill related fitness components for senior athletes.

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ANNEXURES ANNEXURE – I

➢ *Participants Informed Consent Form (English)*

- I have read or have had read to me the information given in the Informed Consent Document for the study titled: **"Effectiveness of a combined balance training program on fall prevention and balance in young elderly individuals – An Experimental Study."**
- I have received an explanation of the nature, purpose, duration and foreseeable effects and risks of the study and what I will be expected to do. My questions have been answered satisfactorily.
- I understand that my participation in this study is voluntary and that I may refuse to participate or may withdraw at any time, without penalty or loss of benefit to which am otherwise entitled.
- I further understand that any information that becomes available during the course of the study that may affect my willingness to take part will be informed to me.
- Institutional Ethics Committee authorities may wish to examine my medical records to verify the information collected.
- By signing this document, I give permission for this review of my records.
- I understand that my identity will not be revealed in any report or publication
- I agree to take to participate in above study.

_____

Name and signature of Research participant Date:

_____

Name and signature of Administering participant Date:

ANNEXURE - II

➢ *Patient Information Sheet*

Patient No.

Name of Institute:

Name of Principle Investigator:

Name of co – Investigator:

Title of study: Effectiveness of a combined balance training program on fall prevention and balance in young elderly individuals – A six weeks experimental study.

The Purpose of Study – The purpose is to check the Effectiveness of a combined balance training program on fall prevention and balance in young elderly individuals.

The Study Purpose – Once you are voluntarily enrolled in this study your assessment will be done for risk of falls and balance and you will be provided with a fall efficacy scale and a timed up and go test scale. You are expected to follow all instructions given in order to complete the scale and answer the questions independently. Then treatment will be administered. The fall efficacy scale and timed up and go test will be taken before and after the treatment. The participants will again fill the falls efficacy scale and timed up go test. The data collected will be analysed and results be generated.

Possible benefits to you – You will not be paying any charges for this. Compensation – In case of any study related injury of adverse effect you will be treated free of charge.

Possible benefits to society – The results of this research may provide benefit to the society in terms of advancement of medical knowledge and therapeutic benefit to future patients. In case of any study related injury/medical problem you will be entitled to get medical treatment free of charge from this institute.

Benefit to participant – You will not be paying any amount for participation in this study.

Confidentiality of information obtained – You have the to maintain confidentiality regarding the privacy of medical information (your personal details and results of physical examination, investigations and medical history). Your identity will not be disclosed to unrelated persons.

By signing the informed consent, you will be allowing the research team investigators, institutional ethics committee, sponsors and any higher authority like drug controller General of India, to view your data if required.

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The results of this research may be published in scientific meetings without disclosing your identity.

Effect of your decision – Your decision not to participate in this research will not affect your medical care or your relationship with the investigator or the institute in future.

The participation in this study is purely voluntary and you have the right to withdraw from this study at any point of time with or without giving any reason through not mandatory it will be advisable to consult your investigator before you withdraw.

Contact person – For further information/questions you can contact any of the following
Principal Investigator: Department:
Phone

DATA COLLECTION SHEET

Name of Patient: Age:

Date of Examination:

OUTCOME MEASURES	PRE-OUTCOME MEASURES	POST-OUTCOME MEASURES (post 6 weeks of intervention)
1]Falls Efficacy Scale		
2]Timed Up Go Test		

Subject's Signature Date:

- Name:
- Age:
- Gender

✓ Male
✓ Female
✓ Other

- E-Mail id:

- Contact Number: _____

FALLS EFFICACY SCALE

ACTIVITY SCORE; 1 = VERY CONFIDENT, 10 = NOT CONFIDENT AT ALL

➢ A total score of greater than 70 indicates that the person has a fear of falling

- Take a bath or shower.
- Reach into cabinets or closets.
- Walk around the house.
- Prepare meals not requiring carrying heavy or hot objects.
- Get in and out of bed.
- Answer the door or telephone.
- Get in and out of a chair.
- Getting dressed and undressed.
- Personal grooming (i.e. washing your face).
- Getting on and off of the toilet.

TIMED UP AND GO TEST.

➢ *Instruction: When I say "Go," I want you to:*

- Stand up from the chair.
- Walk to the line on the floor at your normal pace.

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- Turn.
- Walk back to the chair at your normal pace.
- Sit down again.

On the word "Go," begin timing. Stop timing after patient sits back down. Record time

An older adult who takes ≥12 seconds to complete the TUG is at risk for falling.

GNATT CHART

	Jun- July 2022	Jul- Aug 2022	Sept 2022	Sep 2022	Oct- Mar 2023	Apr- Jun 2023	July 2023	Aug 2023	Sep 2023
Preparation of synopsis									
Final copy									
IEC Approval									
Synopsis submission									
Data collection									
Data Analysis									
Dissertation Submission									

MASTER SHEET

	Sr No	Gender	Age	Falls Efficacy Scale			Timed Up and Go Test		
				Pre	Post		Pre	Post	
	1	Female	69	18	10		13	9	
	2	Male	69	21	15		15	10	
	3	Male	70	23	15		12	11	
	4	Male	72	17	11		12	8	
	5	Male	67	18	13		13	8	
	6	Male	69	18	13		12	9	
	7	Female	68	15	12		11	8	
	8	Female	70	18	13		10	7	
	9	Male	66	20	14		13	12	
	10	Male	68	19	16		14	9	
	11	Male	70	16	11		11	10	
	12	Male	65	14	13		14	14	
	13	Male	72	14	12		12	7	
	14	Female	67	12	10		12	10	
	15	Male	65	15	11		11	10	
	16	Male	66	14	11		10	9	
	17	Male	66	18	13		14	13	
	18	Male	72	19	11		10	8	
	19	Male	65	15	11		14	11	
	20	Male	69	15	11		11	10	
	21	Male	70	12	10		10	10	
	22	Male	69	16	11		11	10	
	23	Male	66	19	14		14	12	

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	24	**Male**	**71**	**16**	**11**		**11**	**7**	
	25	**Male**	**72**	**16**	**11**		**12**	**11**	
	26	**Male**	**74**	**14**	**11**		**14**	**13**	
	27	**Male**	**73**	**14**	**12**		**10**	**10**	
	28	**Male**	**71**	**16**	**13**		**13**	**10**	
	29	**Female**	**73**	**16**	**12**		**10**	**7**	
	30	**Male**	**68**	**14**	**12**		**12**	**11**	
	31	**Male**	**69**	**13**	**11**		**13**	**11**	
	32	**Male**	**69**	**20**	**12**		**10**	**10**	
	33	**Male**	**69**	**13**	**10**		**10**	**9**	
	34	**Male**	**75**	**11**	**11**		**10**	**9**	
	35	**Male**	**72**	**13**	**13**		**13**	**11**	
	36	**Female**	**65**	**12**	**11**		**10**	**9**	
	37	**Male**	**68**	**16**	**12**		**14**	**12**	
	38	**Male**	**72**	**17**	**14**		**10**	**8**	
	39	**Male**	**68**	**13**	**11**		**11**	**10**	
	40	**Male**	**72**	**21**	**12**		**12**	**10**	
	41	**Male**	**68**	**14**	**12**		**11**	**9**	
	42	**Male**	**72**	**11**	**10**		**12**	**10**	
	43	**Male**	**68**	**12**	**11**		**11**	**8**	
	44	**Male**	**72**	**17**	**11**		**12**	**10**	
	45	**Male**	**70**	**12**	**10**		**13**	**12**	
	46	**Male**	**71**	**14**	**11**		**10**	**8**	
	47	**Male**	**72**	**13**	**13**		**13**	**10**	
	48	**Male**	**70**	**12**	**11**		**11**	**10**	
	49	**Male**	**71**	**17**	**11**		**14**	**10**	

	50	**Male**	**71**	**16**	**13**		**11**	**10**	
	51	**Male**	**65**	**15**	**11**		**10**	**9**	
	52	**Male**	**65**	**14**	**12**		**14**	**12**	
	53	**Male**	**75**	**17**	**12**		**12**	**10**	
	54	**Male**	**70**	**13**	**10**		**10**	**8**	
	55	**Male**	**65**	**12**	**11**		**11**	**10**	
	56	**Male**	**73**	**16**	**13**		**12**	**10**	
	57	**Male**	**73**	**15**	**12**		**11**	**9**	
	58	**Male**	**69**	**12**	**10**		**10**	**8**	