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EFFECTS OF HIGHLY CHALLENGING BALANCE TRAINING VS REHABILITION PROGRAMME ON BALANCE AND GAIT IN PARKINSONS DISEASE - COMPARATIVE STUDY.

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ABSTRACT

Background: Parkinson's disease (PD) is a progressive, neurodegenerative disease which leads to postural and gait disorders, limitation in mobility, activities of daily living and disability. Parkinson's disease (PD) leads to the deterioration of gait and balance abilities , decline in physical activity, and decreased quality of life.. Therefore, to prevent balance-related problems and to facilitate the maintenance of a physically active lifestyle, effective nonpharmacological strategies such as novel exercise regimes need to be established for PD.

Aims and methods: The aim of the study is to evaluate the effects of the highly challenging balance training HI balance program, a highly challenging balance training regimen that incorporates dual tasking vs rehabilitation program on balance and gait in PD patients**.**Participants with PD (n = 30) were randomized, either to the 10-week Hi Balance program (n =15) or to the control group (n = 15). Participants were evaluated before and after the intervention. The main outcomes were for balance performance (Mini-BESTest), and for gait (Dynamic gait index).

RESULTS:A total of 30 participants completed the study. After the intervention, the between group comparison showed significantly improved balance and gait performance in the training group. The participants in the training group (Group A Highly challenging group) improved their balance, gait and performance of the cognitive task while walking, as compared with the control group (Group B Rehabilitation group).

CONCLUSIONS: The Hi Balance program significantly benefited balance and gait abilities when compared with general rehabilitation group and showed promising transfer effects to everyday living. Long-term follow-up assessments will further explore these effects**.**

Keywords: Parkinson's, balance training , rehabilitation,gait

INTRODUCTION:

Parkinsons disease is a neurodegenerative disorder of central nervous system that affects predominately dopamine producing neurons in a specific area of the brain called substantia nigra. Parkinsons disease was observed by James Parkinson in the year 1817. It took about 100 yrs. to be well verse with the pathology of this disease condition and treatment was partially achieved by the introduction of levodopa in the year 1960. It is the fastest growing neurological disorder in the world[(1)]

It is a progressive disease which leads to limitation in mobility and activities of daily living and in consequence to disability, dependency and decreased quality of life. It mainly affects the motor system. Poor functioning in daily life is associated with higher risk of falls in parkinsons disease. Many mobility problems in parkinsons disease are associated with postural deficits and conversely: postural disturbances have their reflection in physical performance and activities of daily life. These postural disturbances have a wide range and can be considered in terms of postural instability, falls, difficulties in changing position of the body (e.g. sit to stand, bed mobility)[(2-9)]..

Balance and gait disorders are strongly correlated with disability in Parkinsons disease. Furthermore, postural and gait disturbances are levodopa unresponsive symptoms. According to Shulman, delaying and prevention of disability should be the priority of clinical management in parkinsons disease. Gait and balance impairments are common manifestations of idiopathic parkinsons disease. These motor symptoms are debilitating, leading to decline in balance confidence and self-perceived motor function. Reduced walking capacity and postural instability have consistently been identified as predictors of increased fear of falling and reduced mobility with consequent reduced quality of life [(2-9)].

There is evidence that postural instability associated with parkinsons disease is not adequately improved by levodopa, implying involvement of non-dopaminergic pathways. The postural instability associated with parkinsons disease can have serious consequences because it is linked with falls, increased morbidity and mortality. It poses a difficult challenge because it becomes more prevalent with disease progression while at same time becoming relatively less responsive to levodopa [(20)].

Nevertheless parkinsons disease is a heterogeneous disorder presenting with varied motor phenotypes as well as a variety of non-motor signs and symptoms .Not only is disease the disease of a progressive nature, where severity of symptoms ranges from mild to severe but also various subtypes of parkinosns disease have been suggested to occur at the early disease stage [(21)].

Approximately 60% of people with parkinsons disease fall at least once a year, 39% are considered recurrent fallers with more than one fall. Previous falls, freezing of gait, postural instability, reduced leg strength and cognitive impairment are predictors of future falls [(22)].

The pathophysiology of balance impairments in parkinsons disease incorporates multiple sub systems (sensory, motor, cognition). Sensory problems compromise equilibrium particularly owing to impaired proprioception. Its pathology is due to degeneration of neurons in the striatonigral pathway, there is deficiency in the level of dopamine, and dopamine is a neurotransmitter in the striato nigral pathway that inhibits the excitation of the cholinergic pathway, which has acetylcholine as the neurotransmitter.

Thus, decrease in the dopamine level, removes the inhibitory influence on the cholinergic pathway causing excessive excitation of the extrapyramidal system which causes increased tone in the agonist and athe antagonist. This gives rise to rigidity and bradykinesia.

Gait adjustments with muscle fatigue are more pronounced in individuals over 40 years. of age than in younger individuals. These adjustments appear to be aimed at maintaining adequate control of balance in the fatigued condition. It is convincible that individuals with pd demonstrate even more pronounced gait adjustments since patients with pd present deficits in muscle strength and motor control. Patients with pd present several motor and non-motor impairments, including a higher perception of fatigue than age matched controls. Previous studies indicate that gait is affected by fatigue in an age dependent manner.

Therefore ,to prevent balance related problems and to facilitate the maintenance of a physically active lifestyle ,effective non pharmacological strategies such as novel exercise regimes need to be established for a parkinsons disease patient.[(11-19)]To be successful , all types of training , including balance exercises need to be performed at or near the limit of one's capacity .Also essential for balance and gait control is the ability to perform a motor task while simultaneously engaging in a cognitively demanding task that is dual task .In individuals with parkinsons disease , dual task leads to degraded balance and gait performance resulting invulnerability to fallsduring manydaily activities

However, a balance training compromising highly challenging exercise which involves motor and cognitive demanding exercises may induce synergistic effects for brain plasticity, which could lead to enhanced transfer of training effects to real life situations.

So, the present study aimed to investigate the short-term effects of a 10-week balance program compared with general rehabilitation program on balance and gait in the elderly with mild to moderate parkinsons disease. Thus , it is hypothesized that balance and gait training could lead to specific improvements on balance and gait performance (single task, dual task respectively) and that these effects would also transfer to everyday living (i.e. concerns about falling , physical activity levels and activities of daily living.

AIM OF THE STUDY:

To compare the effects of highly challenging balance training vs rehabilitation program on balance and gait in Parkinsons disease.

NEED OF THE STUDY

Efficiency to improve balance and gait in parkinsons disease which will provide the stability and performance of a cognitive task while walking, physical activity level and activities of daily living. Patients with impaired or inefficient balance and gait may have difficulty in transfer from one place to other and cannot be independent in everyday living.

Balance and gait disorders are strongly correlated with disability in Parkinsons disease. [11-19]Increasing evidence has emerged to support the role of physical exercise for people with parkinsons disease and current recommended practice is to combine physical exercise and dopaminergic medication for the treatment of motor symptoms. Therefore, it is unlikely that a given exercise modality benefit all people with parkinsons disease.

Although it has been purposed that gait and balance training needs to be challenging to be effective ,there is currently no consensus on the optimal ingredients of exercise interventions in people with parkinsons disease .A variety of factors may be important for the response to exercise interventions designed for people with parkinsons disease.

Physical abilities may also play a major role in people with pd .People with parkinsons disease with lower physical functioning may have more room to improve following an intervention where as too low physical capabilities may be a limiting factor since motor learning takes a longer time in this population. Although most studies indicate a beneficial influence of physiotherapy on aspects of balance and gait there are also some defiencies in studies to date and there is a need for further, high quality research .So, prevention of disability should be the priority of management in parkinsons disease. So, identifying and developing the interventions to improve balance and gait to decrease disability and to increase motor function for the patient to become independent is necessary [11-19].

The present study aimed to investigate the short-term effects of highly challenging balance training compared with rehabilitation exercises in people with mild to moderate parkinsons disease. We hypothesized that balance training would lead to specific improvements on balance and gait performance (single and dual tasks) and that these effects also would transfer to everyday living .Therefore the purpose of this study is to apply the highly challenging balance training in patients with parkinsons disease to help

regain their balance and gait and attain their functional independence. There are many studies which shows highly challenging exercises and rehabilitation exercises improves balance and gait in parkinsons patients but very less studies have shown comparison.

So, there is a need to study the highly challenging balance training vs rehabilitation exercises to improve balance and gait in parkinsons disease.

OBJECTIVE OF THE STUDY:

The main objective of the study is to evaluate and compare the effects of highly challenging balance training and general rehabilitation exercises in the elderly patients with mild parkinsons disease.

METHODS:

SAMPLE SIZE: Total of 30 patients.

DURATION OF THE STUDY: 6 months

STUDY DESIGN: Comparative study.

SOURCE OF SAMPLE: KIMS Hospital and physiotherapy clinics in and around Hyderabad.

SAMPLE POPULATION: Both males and females are of age group of 55 -80 yrs.

DURATION OF THE TREATMENT: 10 Weeks.

MATERIALS:

1. Ball
2. Cone
3. Mattress
4. Mirror

INCLUSION CRITERIA:

- Hoehn and yahr score of 2 or 3.
- Age ≥ 50
- Both males and females are included.
- Chronicity of Parkinsons –mild (below 4 months)
- >3 weeks of stable antiparkinsons medication
- The subject's informed written consent for participation was obtained.

EXCLUSION CRITERIA:

- Mini mental state examination score of <24
- Age ≥80
- Any other medical conditions that would substantially influence balance performance

or participation in the intervention

- Severe gait disability with the inability to walk unassisted
- History of orthopedic hip or knee surgery which led to gait difficulties
- Chronic disorders of musculoskeletal system leading to restricted mobility.

METHODOLOGY:

Patients with parkinsons disease who has fulfilled the inclusion criteria were divided into two geographic groups:

- **GROUP A**: Subjects will undergo highly challenging balance and gait training therapy for a period of 10 weeks, 3 times per week, 60 minutes per session.
- **GROUP B:** Subjects will undergo rehabilitation exercises for a period of 10 weeks, 3 times per week, 60 min per session.

PROTOCOL FOR GROUP A: Highly challenging exercises group.

The Hi Balance training program has proved feasible in clinical practice. Because of the highly challenging exercises, each session was supervised by 2 physiotherapists. Importantly, no fixed scheme of predetermined exercises was used in the intervention. Instead, a framework based on motor-learning principles (specificity, progressive overload, and variation) was used as a foundation for the application and adaptation of exercises to the participants' individual abilities. Consequently, this approach not only resembles clinical practice but also requires continuous evaluation, modification, and planning of the training. To target cognitive impairments, DT exercises were gradually integrated into the program by adding concurrent cognitive (e.g., counting, remembering items) and/or motor tasks (e.g., carrying and/or manipulating objects) to the balance exercises.

Highly challenging training conditions were defined as exercises where the participants were forced, intermittently, to use reactive postural adjustments to control their balance during single tasking. Similarly, the level of difficulty for DT exercises was aimed at a level where there was consistent interference of the participants' motor performance. Moreover, to promote progressive overload and exercise variation, the 10-week period was divided into 3 blocks (A, B, C). In block A (weeks 1-2), participants were introduced to the single-task exercises of each balance component separately (no DT-exercises were practiced), emphasizing quality of movement and the objectives of the exercises. In block B (weeks 3-5), basic DT exercises were introduced (approximately 40% of each session), and the level of difficulty for each balance component was increased. The level of difficulty of all the exercises was further enhanced in block C (weeks 6-10) by increasing the variation through exercises that combined several balance components, as well as the level of difficulty and time spent on DT exercises (approximately 60% of each session).

In addition, to ensure alignment to the HI balance program, the trainers were supported in the practical aspects of the training when needed.

A proper designed set of exercise program to improve balance and gait include the following: Four specific balance components to parkinsons disease impairments were emphasized:

1. Sensory integration: Walking tasks on varying surfaces with or without visual constraints.
2. Anticipatory postural adjustments: Voluntary arm, leg, trunk movements.
3. Multi directional stepping.
4. Motor agility: Inter limb coordination under varying gait conditions and quick shifts.
5. Stability limits: Controlled leaning tasks performed while standing with varying base of support, stimulating weight shifts in multiple directions.
6. The gait training aimed at improving balance via repeated practice of straight-line walking, increasing speed; and altering surface challenges.
7. Stability without manipulation activities (e.g. Stand on top of a foam mattress with eyes closed)
8. Stability with handling activities (E.g. Rotate the waist holding a ball)
9. Walking backwards around objects while holding a basket.
10. Walking while counting a three digit number backward.
11. Walking while answering simple question yes or no.
12. Walking tasks include walking forward, backward, obstacle crossing walking,
13. Walking on an S- shaped route and tandem walking.
14. Walking by holding a basketball, walking while bouncing a basketball with either hand.

Walking while reciting a small sentence backward and walking while singing.

PROTOCOL FOR GROUP B: Rehabilitation exercises group

Treatment was focused on various exercises improving balance, postural stability, walking and performance of ADL, including changing position of the body. The rehabilitation program consists of: relaxation exercises, respiratory (breathing) exercises, range of motion and stretching exercises, exercises of trunk rotation in various body positions, mobility exercises and functional training, postural re-education, balance exercises, gait training, music and elements of dance, speech therapy and exercises of facial expression as well as education. The number of repetitions depended on the individual capacity of each patient; however, in the beginning the number was small and gradually increased as the patients' ability improved.

All the exercises were performed with sensory enhancement in the form of external sensory cues, such as verbal, auditory, visual, proprioceptive or tactile stimulation. To provide sensory reinforcement and help increase the patients' awareness of movement, we used verbal commands, counting, clapping, music, mirrors and floor markings. Exercises were performed in various body positions. Patients practiced weight-shifting exercises on various surfaces and with different feet positions.

These are the simple rehabilitation exercises given to parkinsons patients:

1. Rehabilitation exercises: lying supine, rotation of lower limbs, rolling the head on a mat from side to side.
2. Balance exercises: weight shifting exercises on various surfaces with different feet position.
3. Gait training: distance walking (upright posture, arm swing etc.)
4. General breathing exercises.
5. Side and backward walking
6. Turning and changing direction, stop and go exercises.
7. On the obstacle course: overcoming obstacle
8. Postural reeducation: correction of body posture before each exercise and to consciously maintain upright posture.
9. Range of motion, stretching exercises in various positions to maintain or increase range of movement and muscle length.
10. Speech therapy and facial expression exercises: sitting position in front of a mirror, exercising voice power, facial expressions and fall prevention are taught.

OUTCOME MEASURES

FOR BALANCE:

Minibestest[43]:

The Mini-BESTest is a clinical balance test that has shown a high sensitivity in detecting balance impairments in elderly with Parkinson's disease (PD). The Mini- BESTest showed good reliability for both inter-rater and test-retest reproducibility (ICC = 0.72 and 0.80). Regarding agreement, the measurement error (SRD) was found to be 4.1 points (accounting for 15% of the maximal total score) for inter-rater reproducibility and 3.4 points (12% of the maximal total score) for test-retest reproducibility.

FOR GAIT:

Dynamic gait index[42]:

The Dynamic Gait Index (DGI) was developed as a clinical tool to assess gait, balance and fall risk. It evaluates not only usual steady-state walking, but also walking during more challenging tasks.

It assesses the individual's ability to modify balance while walking in presence of external demands. The DGI showed high reliability and showed evidence of concurrent validity with other balance and mobility scales. It is a useful clinical tool for evaluating dynamic balance

STATISTICAL ANALYSIS:

- Student t test (two tailed, dependent) has been used to find the significance of study parameters on continuous scale within each group. Willcoxon Signed rank test has been used to find the significance of median score in two groups.

- Chi-square/ Fisher Exact test has been used to find the significance of study parameters on categorical scale between two or more groups, Non-parametric setting for Qualitative data analysis. Fisher exact test used when cell samples are very small.

Study design: A comparative two groups in clinical study

Table 1: Age distribution of patients studied

Age in years	Group A	Group B	Total
51-60	7(46.7%)	3(20%)	10(33.3%)
61-70	5(33.3%)	5(33.3%)	10(33.3%)
71-80	3(20%)	7(46.7%)	10(33.3%)
Total	15(100%)	15(100%)	30(100%)
Mean ± SD	62.67±6.18	67.07±7.29	64.87±7.01

Samples are age matched with P=0.100, student t test

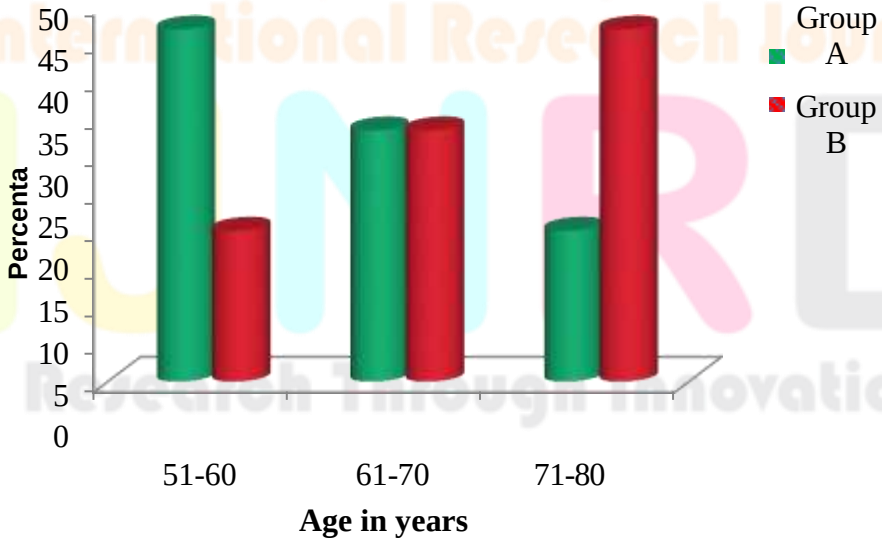
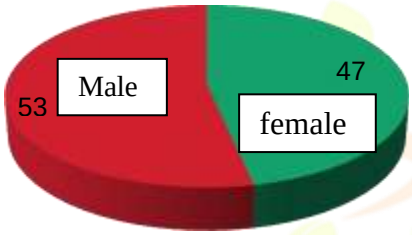
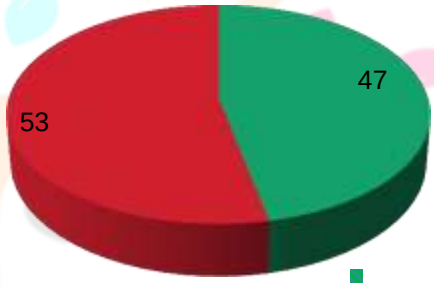


Table 2: Gender distribution of patients studied

Gender	Group A	Group B	Total
Female	7(46.7%)	7(46.7%)	14(46.7%)
Male	8(53.3%)	8(53.3%)	16(53.3%)
Total	15(100%)	15(100%)	30(100%)

Samples are gender matched with P=1.000, Chi-square test



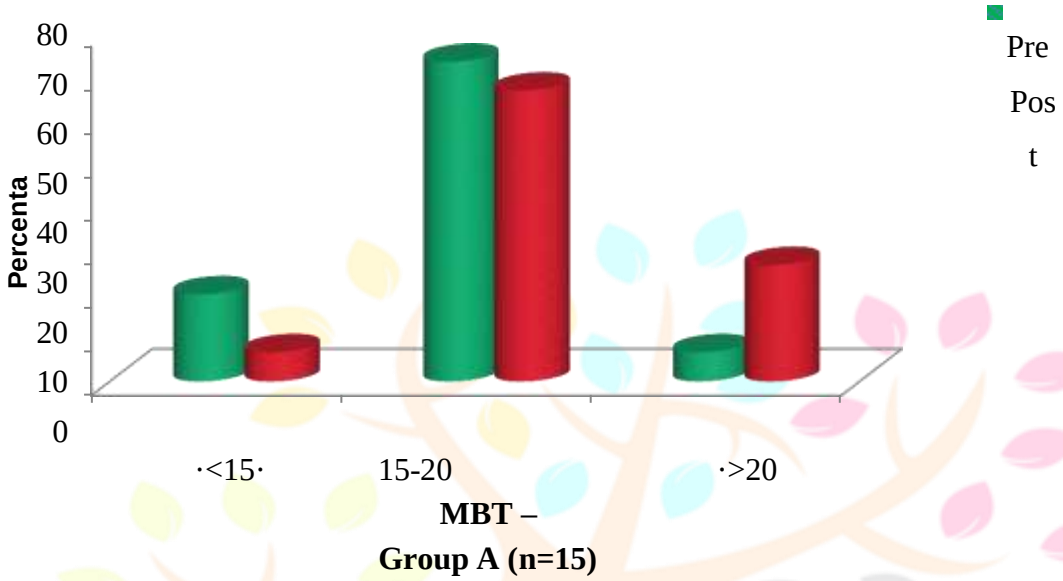


Group A **Group B**

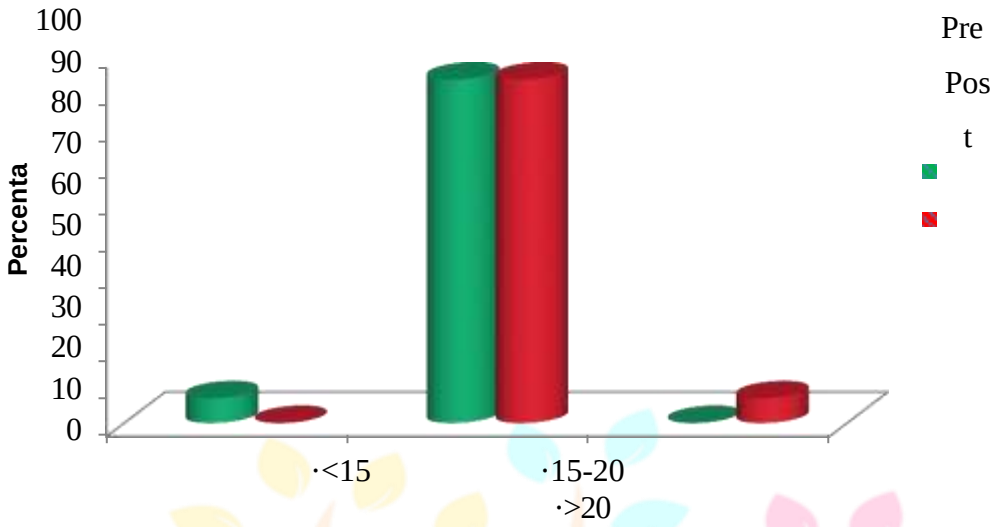
Table 3: MBT distribution in two groups of patients studied at pre and post assessment

MBT	Pre	Post	% difference
Group A (n=15)			
• <15	3(20%)	1(6.7%)	-13.3%
• 15-20	11(73.3%)	10(66.7%)	-6.6%
• >20	1(6.7%)	4(26.7%)	20.0%
Group B (n=15)			
• <15	1(6.7%)	0(0%)	-6.7%
• 15-20	14(93.ss3%)	14(93.3%)	0.0%
• >20	0(0%)	1(6.7%)	6.7%
P value	0.330	0.169	-

Chi-Square/Fisher Exact Test



Group A (n=15)

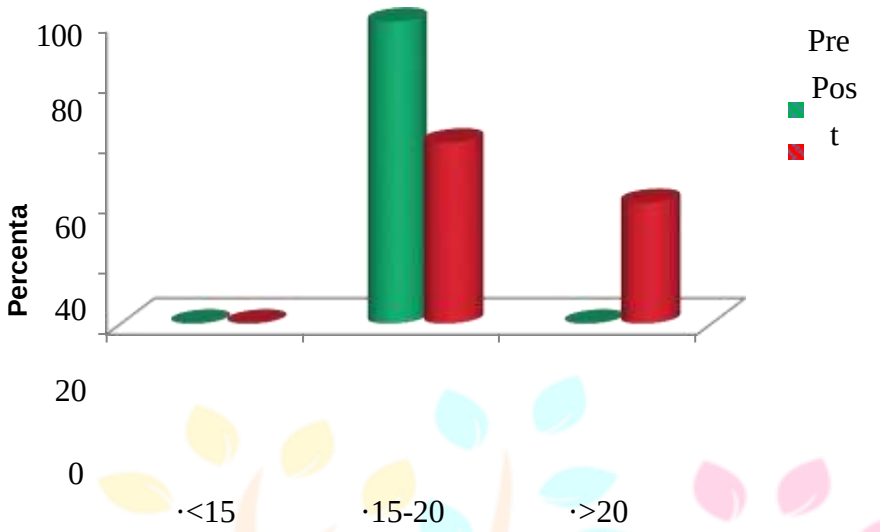


MBT - Group B (n=15)

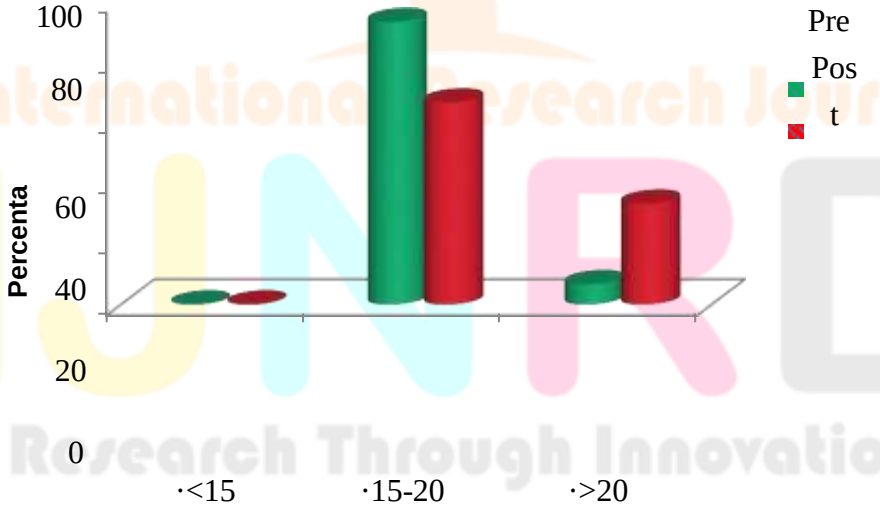
Table 4: DGI- distribution in two groups of patients studied at pre and post assessment

DGI	Pre	Post	% difference
Group A (n=15)			
• <15	0(0%)	0(0%)	0.0%
• 15-20	15(100%)	9(60%)	-40.0%
• >20	0(0%)	6(40%)	40.0%
Group B (n=15)			
• <15	0(0%)	0(0%)	0.0%
• 15-20	14(93.3%)	10(66.7%)	-26.6%
• >20	1(6.7%)	5(33.3%)	26.6%
P value	1.000	1.000	-

Chi-Square/Fisher Exact Test



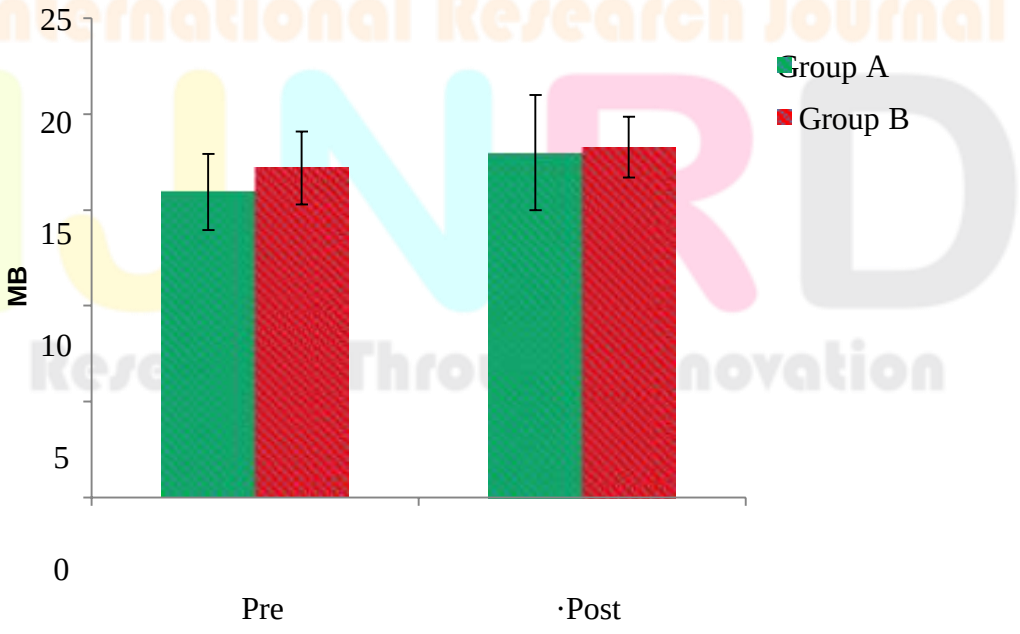
DGI - Group A (n=15)

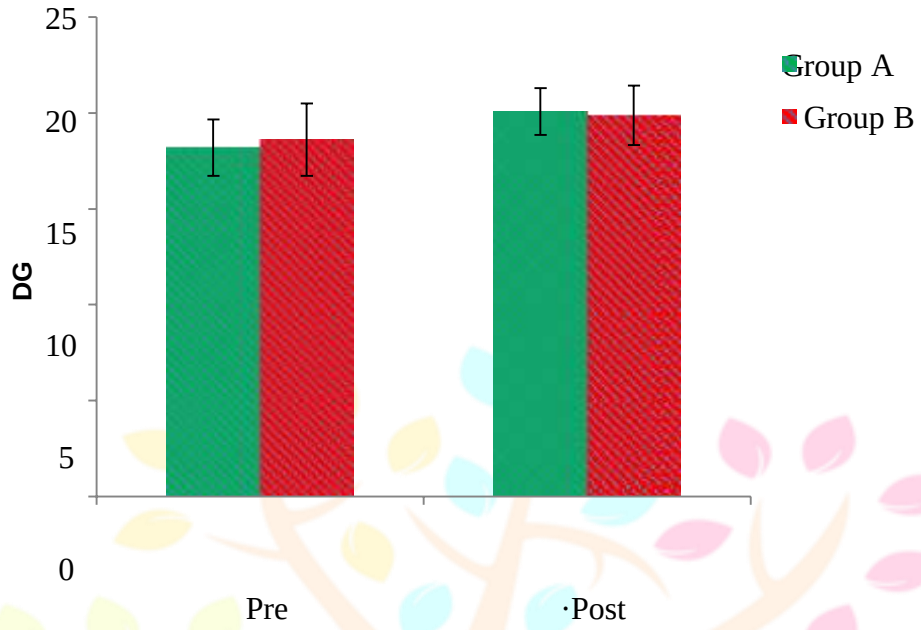


DGI - Group B (n=15)

Table 5: A Comparison of outcome variables according to two groups studied

	Group A	Group B	Total	P value
MBT				
• Pre	15.93±1.98	17.20±1.90	16.57±2.01	0.085+
• Post	18.00±3.00	18.27±1.58	18.13±2.36	0.763
• Difference	2.06	1.06	1.57	-
• P value	0.012*	0.112	0.003**	-
DGI				
• Pre	18.20±1.47	18.60±1.88	18.40±1.67	0.522
• Post	20.07±1.22	19.87±1.55	19.97±1.38	0.698
• Difference	1.87	1.27	1.57	-
• P value	0.002**	0.039*	<0.001**	-





STATISTICAL METHODS:

Descriptive and inferential statistical analysis has been carried out in the present study. Results on continuous measurements are presented on Mean □ SD (Min-Max) and results on categorical measurements are presented in Number (%). Significance is assessed at 5 % level of significance. The following assumption on data is made.

Assumptions:

1. Dependent variables should be normally distributed,
2. Samples drawn from the population should be random, Cases of the samples should be independent

A t-test is a statistical test that is used to compare the means of two groups. It is often used in hypothesis testing to determine whether a process or treatment actually has an effect on the population of interest, or whether two groups are different from one another with the null hypothesis means is zero and the alternate hypothesis (Ha) is that the true difference is different from zero.

Student t test (two tailed, dependent) has been used to find the significance of study parameters on continuous scale within each group. Willcoxon Signed rank test has been used to

find the significance of median score in two groups

Chi-square/ Fisher Exact test has been used to find the significance of study parameters on categorical scale between two or more groups, Non-parametric setting for Qualitative data analysis. Fisher exact test used when cell samples are very small.

SIGNIFICANT FIGURES:

+ Suggestive significance (P value: 0.05<P<0.10)

* Moderately significant (P value: 0.01<P □ 0.05)

** Strongly significant (P value: P□0.01)

Statistical software: The Statistical software namely SPSS 22.0, and R environment ver.3.2.2 were used for the analysis of the data and Microsoft word and Excel have been used to generate graphs,tableetc

RESULTS:

- All the participants completed the program. At the completion of the program all were reported with the improvement of balance and gait. Comparison of the scores of the balance and gait scale was done on the first day as well as on the last day of the 10th week for both the groups.
- Overall 55-80 years age group subjects participated in the study.
- Among all the 30 participants 33.3 % of participants were of age group 51-60 years and 33.3% subjects were of 61-70 years age group, 33.3 % were of 71-80years age group. About 46.7 % female and 53.3%male participated in the study.
- Here group A represents highly challenging group i.e. dual task training and group B represents rehabilitation exercises group.
- The Minibestest component (Table 5) shows improvement in the post-intervention scores from the pre-Intervention scores in both the groups. In group A post intervention score shows an improvement with a mean difference 2.06 with p value of 0.012 and in group B post intervention score shows an improvement with a mean difference of 1.06 with p value of 0.112 which interprets that group A has more improvement than group B in Balance.

- The dynamic gait index component (table 5) shows improvement in the post intervention scores from the pre-Intervention scores in both the groups. In group A post intervention score shows an improvement with a mean difference 1.87with p value of 0.002 and in group B post intervention score shows an improvement with a mean difference of 1.27with p value of 0.039 which interprets that group A has more improvement than group B in Gait.

- All the components of Minibestest and dynamic gait index have proved to have showed more improvement in group A than group B.

- By statistical analysis we found that there is statistically significant effect of present intervention on balance and gait in both the groups. Hence, alternate hypothesis is accepted.

DISCUSSION:

In the current study, the HI Balance training program has proved feasible in clinical practice. The balance and gait training were performed in 2 groups with each of 15 participants, 3 times per week, 60 minutes per session, for 10 weeks. In which group A is highly challenging training and group B patients received rehabilitation exercises.

The present study is a comparative study that evaluates the effectiveness of highly challenging balance training and rehabilitation exercises. The findings of this trial revealed that the training group that received a specific intervention targeting balance and gait performance improved significantly better in terms of balance control and gait performance when compared with the control group that received usual rehabilitation exercises. This study has rejected the null hypothesis and accepted the alternate hypothesis showing that highly challenging exercises showed significant results in balance and gait after 10 weeks of treatment. Almost all the subjects who underwent the treatment of highly challenging training noticed improvement.

Though there is a significant increase in both group A and group B. On scores obtained after the treatment, the efficacy of the treatment can be evaluated.

- The mean score difference of Minibestest in between group A is 2.06 and of group B is 1.06 which indicates that group A showed significant improvement than group B .
- The mean score difference of dynamic gait index in between group A is 1.87 and of group B is 1.27 which indicates that group A showed significant improvement than group B.

Consistent with 2 meta-analyses reporting the beneficial short-term effects of exercise on balance performance in individuals with PD, we found a significant effect and a large effect size (0.82) for

the Mini-BESTest in the training group. Our effect size on balance performance was similar to previous studies that evaluated challenging balance exercises in PD.

The Mini-BESTest is a multi-item test that aims to cover the complexity of balance performance hence our results indicate that in PD, it may be important to use a combination of tests in order to cover different aspects of balance impairments. This 3- point improvement on the Mini-BESTest exceeds the previously found standard error of measurement (1.5 points) in elderly individuals with mild to moderate PD.

The DGI is an 8-item tool used to rate a patient's stability during adaptive walking tasks. The DGI scores range from 0 to 24, with a higher score indicating better walking function.

Although we found no differences between groups regarding DT gait performance, the training group improved the performance of the cognitive task while walking compared with the control group. Since the performance of the cognitive task was unchanged when performed as a single task (while seated), it provides evidence of a specific improvement regarding DT performance in the training group. These DT improvements may derive from increased automatization of single tasks, or it might be a consequence of improved efficiency in integrating both tasks.

A study conducted by Irene S. K. wong –yu , Margaret k.y.mak on patients with parkinsons disease has demonstrated that exercise intervention can improve balance and gait performance in people with parkinsons disease. So dual task and multi-dimensional exercise training has been assigned to these patients and in which immediately after training, experimental group showed more significant improvements than the control group with the p value (<0.05). The positive findings of this study provide evidence that this multi-dimensional balance training programme can enhance balance and dual task balance and gait performance up to 12 months follow up in people with parkinsons disease.

This is the first review study to report that exercise intervention can improve balance and gait performance over the short- and long-terms in people with PD. The subgroup meta-analysis results showed that training at facilities led to more improvement in balance and gait ability over the long-term than the community- and home-based training. Facility-based training, mostly supervised by physical therapists, could have enabled participants to practice the training tasks at their optimal capacity. Therapists in these studies applied motor learning principles such as progression from simple to difficult tasks, attentional strategies, and augmented feedback to enhance learning and practice,

leading to better retention of the learned balance strategies and reduced fall risk. In conclusion, exercise training can improve balance and gait ability in individuals with PD and decrease their fall

rates over both the short- and long-terms, which may provide guidance for treatment or for future trials in the PD population.

A study conducted by Zhenlan li, tian wang ,haoyang liu ,yan jiang et al on patients with parkinsons disease was to systematically evaluate and quantify the effectiveness of dual task training on gait , balance and motor parameters in individuals with diagnosed with parkinsons disease.

They included randomized controlled trials (RCTs) and non-RCTs to evaluate the effects of dual-task training compared with those of non-intervention or other forms of training. The measurements included gait parameters, motor symptoms and balance parameters. Dual-task training was effective in improving gait performance, motor symptoms and balance in patients with Parkinson's disease relative to other forms of training or non-intervention.

A study conducted by Martin benka Wallen, et al has conducted study to determine the long term effects of a highly challenging training program in people with parkinsons disease with the outcome measure of Minibestest for balance

Participants in the training group ($n = 51$) received 10 weeks (three times/week) ofbalance and gait exercises, incorporating dual-tasks, while the control group ($n = 49$) received care as usual. These results suggest that training effects diminish within 6 months after balance training, implying that the program may need to be repeated regularly.

Therefore the results , according to the present study, after the training of highly challenging exercises VS rehabilitation exercises has been proved that balance and gait has significantly improved after the highly challenging training when compared to the rehabilitation group.

CONCLUSION:

Therefore, after analyzing the data the following conclusions were drawn:

According to the study both the techniques i.e. highly challenging exercises and rehabilitation group are effective and showed significant improvement in increasing both the balance and gait functions in people with Parkinsons disease.

There is a significant difference in between highly challenging exercises and rehabilitation exercises in improving balance and gait in people with Parkinsons disease.

Highly challenging exercises group is comparatively more effective than rehabilitation exercises group in improving both balance and gait in people with parkinsons disease.

LIMITATIONS:

1. This study has low sample size.
2. There is only certain age group included.
3. Only mild chronicity of parkinsons disease patients were considered.
4. It did not assess the cognitive component like (fear, kinesiology, focus, attention).
5. Functional activities of daily living benefiting balance and gait is not evaluated in the study.
6. Tone, fatigue and other clinical features effecting the balance and gait were not assessed and evaluated in the study.
7. Postural assessment is not considered.
8. Freezing of gait and falls are not considered and evaluated.
9. Swaying is not considered.
10. There is no long term follow up

FUTURE IMPLICATIONS:

1. Further studies can be done on balance and gait assessment along with intervention can be taken up.
2. All the stages of parkinsons disease depending on chronicity should be taken into consideration.
3. There can be more number of outcome measures taken into consideration.
4. Sample size can be increased.
5. Cognitive training along with functional training can be done.
6. All the age groups can be considered.
7. Intervention based on balance and gait can be evaluated.
8. Assessment of other clinical features like tone, fatigue, and breathing difficulties can be evaluated.
9. Posture, swaying, freezing of gait and falls can be evaluated and assessed.
10. Long term follow up can be done.

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