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ORIGINAL ARTICLE

The Impact of Supervised Home-Based Progressive Resistance Exercise Programs on Depressive Symptoms in Community Dwelling Older Adults

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ABSTRACT

Background: Depression among elderly individuals is a prevalent concern, often leading to diminished quality of life. Progressive Resistance Exercise (PRE) has been identified as a potential intervention to alleviate depressive symptoms in this demographic.

Objective: To evaluate the efficacy of home-based Progressive Resistance Exercise in reducing depressive symptoms among community-dwelling elderly adults.

Methods: A randomized controlled trial was conducted involving 30 community-dwelling elderly individuals (15 males and 15 females) aged 65-85 years, all exhibiting mild-to-moderate depression as indicated by a Geriatric Depression Scale (GDS) score between 11 and 19. Participants were randomly assigned to two groups:

- **Experimental Group (n=15):** Engaged in home-based Progressive Resistance Exercise.
- **Control Group (n=15):** Participated in free active range of motion exercises.
- **Results:** Both groups exhibited significant reductions in GDS scores post-intervention, indicating decreased depressive symptoms. The Experimental Group demonstrated a mean GDS reduction of 1.8 points, while the Control Group showed a mean reduction of 0.92 points. The difference between groups was statistically significant ($p<0.000$), suggesting that PRE was more effective in reducing depressive symptoms compared to ROM exercises.
- **Conclusion:** The study concluded that both Progressive Resistance Exercise and free active range of motion exercises are effective in reducing depressive symptoms among older adults. The findings were highly significant in both groups, with the Experimental Group showing a more pronounced

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improvement. This suggests that Progressive Resistance Exercise may offer a more effective intervention for alleviating depression in elderly individuals.

KEYWORDS

• Depression • Progressive Resistance Exercises (PRE) • Geriatric Depression Scale (GDS) • Aging

INTRODUCTION

Depression significantly impacts the health and well-being of older adults, characterized by persistent sadness, loss of interest, and reduced energy.[1,2] While various factors contribute to its development, including chronic illnesses and social isolation, physical inactivity plays a crucial role.[3,4] Evidence strongly supports the positive impact of physical activity on mental health in older adults.[5,6] While aerobic exercise has demonstrated effectiveness in reducing depressive symptoms[7], resistance training (strength training) is gaining recognition as a valuable intervention. Resistance training involves exercises that work against resistance, such as lifting weights or using resistance bands. It offers numerous benefits for older adults, including increased muscle mass and strength, improved bone density, and enhanced functional capacity.[8] Emerging research suggests that resistance training can also have a positive impact on mental health.[9] The exact mechanisms through which resistance training alleviates depression are not fully understood. However, several potential pathways have been proposed: Neurobiological Changes: Resistance training may stimulate the release of endorphins, neurotransmitters associated with mood elevation.[10] It may also increase levels of brain-derived neurotrophic factor (BDNF), a protein crucial for neuronal growth and survival, which is implicated in the pathophysiology of depression.[11] Reduced Inflammation: Chronic inflammation is linked to an increased risk of depression.[12] Resistance training may help reduce systemic inflammation, contributing to improved mood.

Improved Self-Efficacy: Successfully completing a resistance training program can boost self-esteem and confidence, leading to a more positive outlook and reduced feelings of helplessness. Increased Social Interaction: Supervised home-based programs may provide opportunities for social interaction with trainers or exercise groups, which can combat social isolation and loneliness, both risk factors for depression. Evidence from Research: Multiple studies have demonstrated the effectiveness of resistance training in reducing depressive symptoms in older adults.[13,14]. These studies typically involve supervised programs with personalized exercise plans and regular monitoring. Meta-analyses and reviews have consistently shown that resistance training can significantly reduce depressive symptoms in older adults with varying levels of baseline depression severity[15, 16]. Studies investigating home-based programs have yielded promising results, suggesting that supervised home-based resistance training can be effective in improving mental health outcomes in community-dwelling older adults. Supervised home-based progressive resistance exercise programs hold significant promise as an effective intervention for reducing depressive symptoms in community-dwelling older adults. These programs offer a convenient and accessible way for older adults to improve their physical and mental health.

METHODOLOGY

Sample: A total of 30 community-dwelling elderly individuals (15 males and 15 females) aged 65-85 years with mild-to-moderate depression (Geriatric Depression Scale GDS score 11-19) were recruited from Uttarakhand, India.

Inclusion Criteria:

- Age: 65-85 years
- GDS score: 11-19
- Mini-Mental State Examination (MMSE) score > 22
- No current physiotherapy treatment
- No current antidepressant medication

Exclusion Criteria:

- Neurological problems other than depression
- GDS score <11 or >19
- Musculoskeletal disorders (e.g., acute

injuries, fractures)
- Cardiovascular problems
- Cognitive impairment (MMSE < 22)
- History of suicidal tendencies

Study Design:

An experimental study with a randomized controlled trial design.

Instrumentation:

- **Outcome Measure:** Geriatric Depression Scale (GDS)

Assessment Tools:

- **GDS:** A 30-item self-report questionnaire assessing depressive symptoms.
- **MMSE:** A 30-point scale assessing cognitive function.

Exercise Equipment:

- Dumbbells
- Weight cuffs

Procedure:

- *Recruitment and Screening:* Participants were recruited from the community and screened for eligibility based on inclusion/exclusion criteria.
- *Randomization:* Eligible participants were randomly assigned to two groups:
- *Experimental Group (n=15):* Progressive Resistance Exercise (PRE) training.
- ***Control Group (n=15):*** Active Range of Motion (ROM) exercises.

INTERVENTION

PRE Group:

Two sessions per week for four weeks.

- **Each session:** 45-60 minutes, including 5 minutes warm-up and cool-down.
- **Exercises:** Biceps curls, triceps extensions, shoulder raises, knee extensions, straight-leg raises, hamstring curls.
- **Intensity:** Progressively increased from 40-50% to 60-65% of 1-repetition maximum (1RM) over four weeks.

Control Group:

- Two sessions per week for four weeks.
- *Each session:* 45-60 minutes, including 5 minutes warm-up and cool-down.
- *Exercises:* Active ROM exercises for major joints of the upper and lower limbs.

Data Collection:

- *Baseline:* GDS administered before the intervention.
- *Post-intervention:* GDS administered immediately after the four-week intervention.

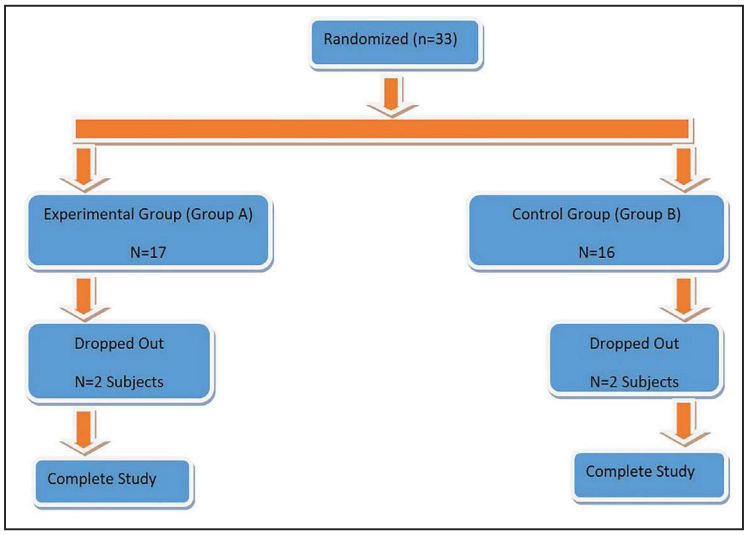
Sphygmomanometer

Dumbells

Subjects exercising knee extension with Dumbbells

Subject exercising triceps with Dumbbell

Flow chart



RESULTS

The study analyzed 30 subjects (15 per group). Paired t-tests compared pre-post values within groups, unpaired t-tests between groups. SPSS 13 and SIGMASTATE calculated results at a 0.05 significance level.

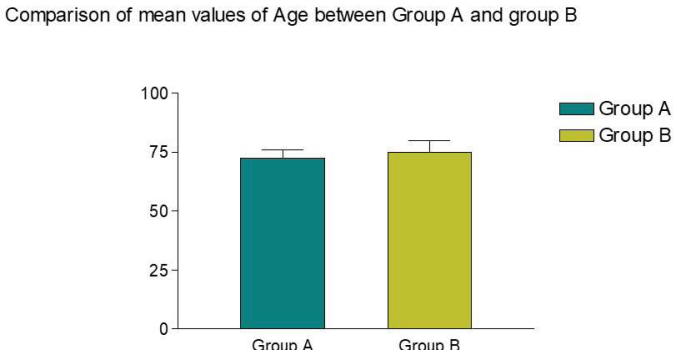
Groups description

- Total Subjects → 30
- Group A → 15 (Experimental Group)
- Group B → 15 (Control Group)
- Level of Significance → 95%
- P < 0.05 → Significant
- P > 0.05 → Not Significant

Comparison of age between Group A and Group B.

Table 1: Depicts the age difference between the Group A and Group B

Demographic	Experimental Group		Control Group	
	Mean	SD	Mean	SD
Age (Yrs)	72.53	3.627	74.93	4.84



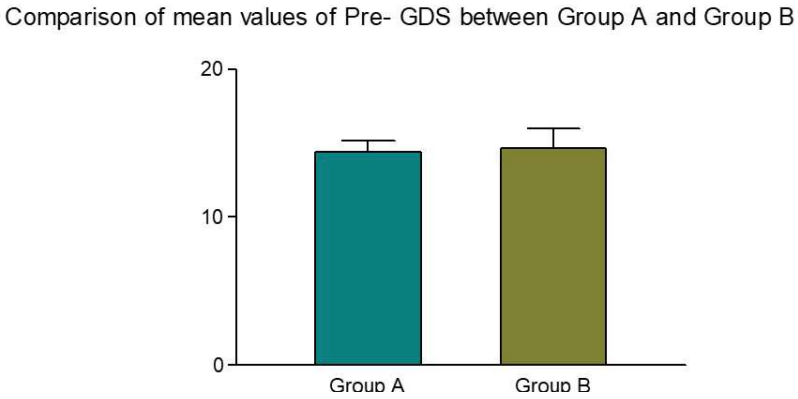
Graph 2: Shows mean ages: Group A 72.53, Group B 74.93, with a 2.4 difference

Unpaired t-test: Intergroup comparison of Pre GDS score of Group A and Group B.

Table 2: Shows intergroup comparison of mean and standard deviation of Pre GDS Score of both the Group A and Group B

GDS	Group A		Group B	
	Mean	Std. Deviation	Mean	Std. Deviation
Pre	14.4	.7368	14.7	1.29
		t = -.695		
		P = .013		

Intergroup comparison of mean values of GDS Pre of Group A and Group B

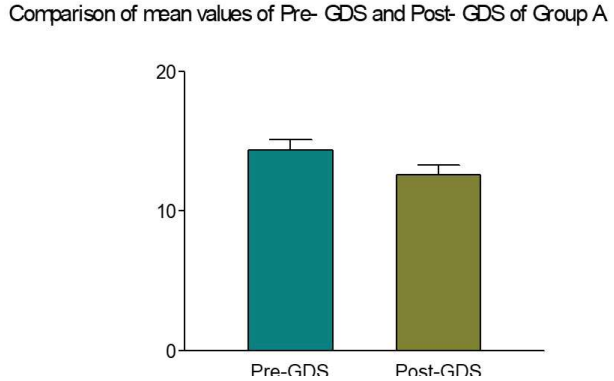


Graph 3: Shows pre-GDS scores: Group A 14.4, Group B 14.7

Paired t-test: Intragroup comparison of mean and SD of Pre GDS and Post GDS for Group A and group B

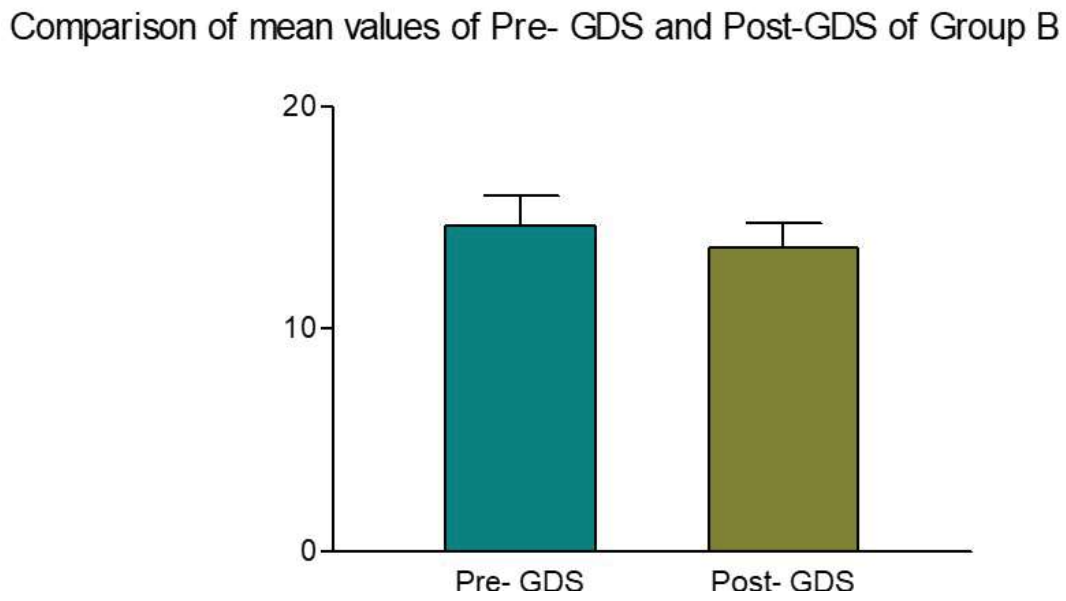
Table 3: Shows highly significant pre-post GDS score improvements for Group A (t=9.53) and Group B (t=7.24, p<0.0001). Paired t-test: Intragroup comparison of Pre-Post GDS of Group A

Gds Score	Group A				Group B			
	Geriatric Depression Scale Score				Geriatric Depression Scale Score			
	Pre		Post		Pre		Post	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
	14.4	0.736	12.6	0.72	14.7	1.29	13.78	1.05
	t value = 9.53				t value = 7.24			
	p value < 0.000				p value < 0.000			



Graph 4: Depicts improvement in mean difference of pre and post GDS score of subjects of Group A. The pre and post GDS score of Group A is 14.4 and 12.6 respectively

Paired t-test: Intragroup comparison of Pre-Post GDS of Group B



Graph 5: Shows Group B's GDS improvement: 14.7 to 13.78

Unpaired t-test: Group A vs Group B

Intergroup comparison of GDS scores for Group A and Group B

Table 4: Depicts the difference of Pre and Post GDS score of Group A and Group B

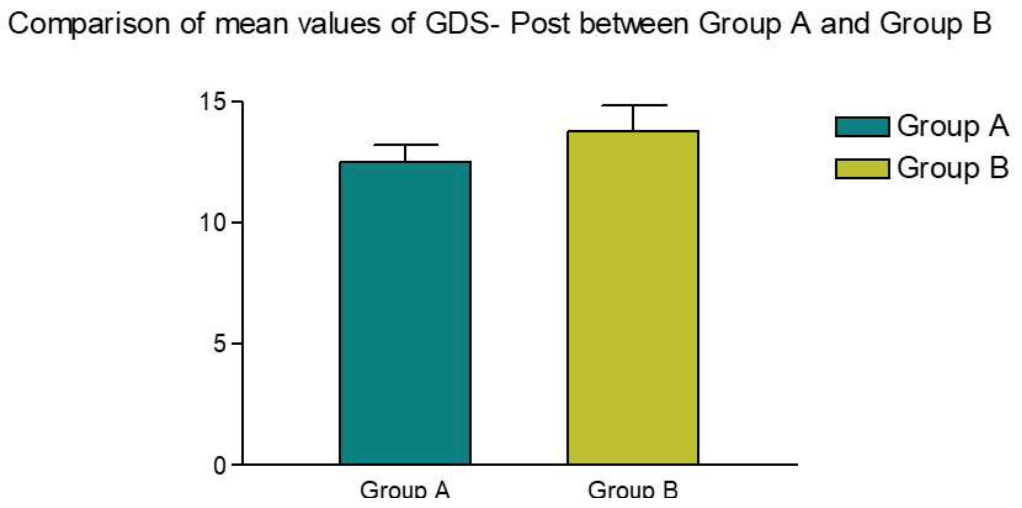
GDS	Group A		Group B	
	Mean	**Std. Deviation**	**Mean**	**Std. Deviation**
Pre	14.4000	.7368	14.6667	1.2910
		t = -.695		
		P = .013		
GDS	**Group A**		**Group B**	
	Mean	**Std. Deviation**	**Mean**	**Std. Deviation**
Post	12.6667	.7237	13.6667	1.0465
		t = -3.044		
		P = .005		

Unpaired t-test: Intergroup comparison of Post GDS score between Group A and Group B.

Table 5: Depicts the mean and standard deviation of post Intervention (Post-GDS) training scores of Group A and Group B

GDS	Group A		Group B	
	Mean	**Std. Deviation**	**Mean**	**Std. Deviation**
Post-GDS	12.6667	.7237	13.6667	1.0465
	t = 9.539		t = 7.246	
	P = .000		P = .0001	

Unpaired t test: Intergroup comparison of Post GDS score between Group A and Group B.



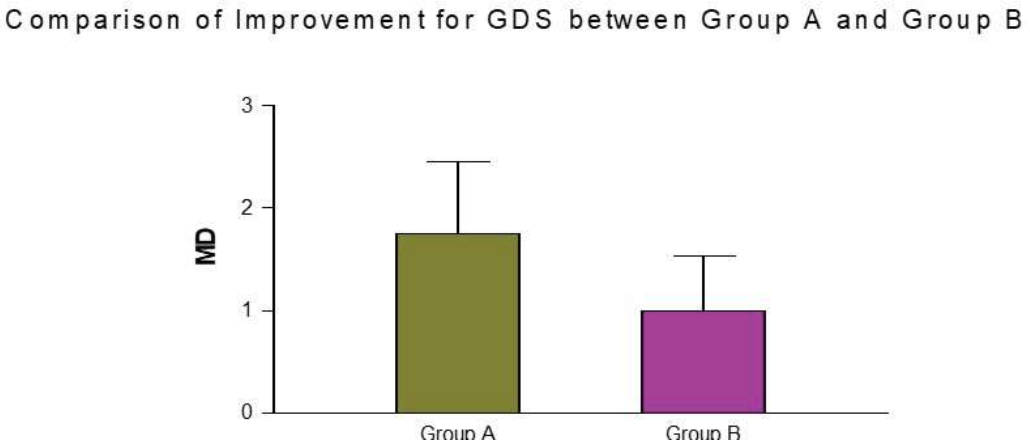
Graph 6: Shows a mean difference of 1.18 between Post GDS Scores of Group A and B

Intergroup comparison of improvement in depression between the Experimental Group (Group A) and Control group (Group B).

Table 6: Shows mean difference between Pre Post GDS Value of both the Group A and Group B

	Group A	Group B
GDS	Mean Difference of Pre vs Post GDS	Mean Difference of Pre vs Post GDS
	1.8	0.92

Intergroup comparison of improvement in depression between the Experimental group (Group A) and Control group (Group B).



Graph 7: Shows GDS improvement: Group A 1.8, Group B 0.92, highlighting Group A's greater change

The study revealed no significant age difference between groups (mean difference: 2.4). Pre-treatment GDS scores showed no significance. Paired t-tests showed significant post-treatment GDS score improvement in Group A (mean difference: 1.8, $p<0.000$) and Group B (mean difference: 0.92, $p<0.000$). Post-treatment intergroup differences were less significant, favoring Group A.

DISCUSSION

A randomized clinical trial found that both home-based progressive resistance exercise (PRT) and active range of motion exercise significantly reduced Geriatric Depression Scale (GDS) scores in elderly adults with depression. However, the PRT group showed greater improvement, with mean GDS

reductions of 1.8 versus 0.92 in the control group. Exercise may reduce depression by increasing brain-derived neurotrophic factor (BDNF), which promotes neurogenesis, enhances mood regulation, and mimics antidepressant effects.[19] BDNF supports neuroplasticity, cognitive function, and stress adaptation while reducing allostatic load.[23] Exercise-induced BDNF modulates serotonin and norepinephrine, counteracting rumination and paralleling the effects of antidepressants.[20] Thus, exercise offers neuroprotective and mood-enhancing benefits for individuals with depression. This study found that PRT significantly reduced depression in elderly adults, with greater improvements in the experimental group compared to the control. PRT enhanced muscle strength, self-efficacy, and cognitive function, supported by increased BDNF and IGF-1 levels, suggesting combined physical and psychological benefits for depression relief.[21]

PRT increased IGF-1 levels and potentially influenced neurogenesis and brain plasticity, providing neurobiological support for its antidepressant effects. Exercise-induced changes in brain function, such as enhanced plasticity and angiogenesis, may further support mood improvement.[17] The mechanisms likely involve BDNF, IGF-1, and VEGF, which regulate brain function, learning, and depression.[22] Overall, PRT may be more effective in reducing depression symptoms in older adults compared to other exercises.[18]

Limitation and future study:

This study has several limitations, including a small sample size, exclusion of individuals with Major Depressive Disorder, and age restrictions (65-85 years). Additionally, no follow-up was conducted to assess long-term effects. Future research should focus on larger sample sizes, including younger or clinically depressed populations, and compare Progressive Resistance Exercise with other therapeutic exercises for depression.

CONCLUSION

The study concluded that both Progressive Resistance Exercise and Free Active Range of Motion exercises are effective in reducing depression symptoms in older adults. The results showed significant reductions in Geriatric Depression Scale (GDS) scores for both groups, with the experimental group (Group A) showing more significant improvements than the control group (Group B).

Clinical Significance

The clinical significance of this study lies in its demonstration that Progressive Resistance Exercise produces substantial antidepressant effects within four weeks, a time frame similar to the latency period typically required for therapeutic effects from selective serotonin reuptake inhibitors (SSRIs). This highlights the potential of exercise as a timely and effective alternative for managing depression in older adults.

Conflict of Interest: The authors declare no conflict of interest.

Funding: self

Ethics declaration: This study was conducted by me and All participants provided written informed consent prior to participation.

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