Exercise as an Effective Non-Pharmacological Intervention for Geriatric Depression: A case study

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Abstract

Background: Geriatric depression is huge and important issue which comes with the economic burden of billions of dollars annually. It not only reduces quality of life but also affects overall health of geriatric patients suffering from it. Mostly older people do not do regular physical activity due to various reasons and rely on medication to manage depression. Such medicines provide fast response but they also pose severe side effects and the risk of dependency. That is why exercise in best approach to manage depression.

Methods: It was randomized controlled case study with 32 patients aged>65 divided into control and experimental group. Control group was only given antidepressants while experimental group received regular strength and aerobic training 3x/week for 8-weeks continuously for 45 minutes. Geriatric depression scale (GDS) was used to measure depression in pre and post intervention.

Results: Statistically significant results were observed in this case study. Experimental groups showed considerable decrease in GDS score (mean 14.69) whereas control group did not show much decrease in GDS score.

Conclusion: Regular strength and aerobic training are very beneficial in managing depression in elderly patients.

Key words: Depression, elderly, Strength training, aerobic exercises, medication.

Background

By 2030, it is projected that depression will become the leading and most prevalent disabling condition, incurring substantial costs for depression medications and associated psychiatric care annually (Lépine et al., 2011; Joshi et al., 2023). Given the tightening healthcare budgets, there is a growing interest in the development and assessment of alternative or complementary treatments for depression (Singh et al., 2023). Historically, depression has primarily been managed through pharmacological interventions, psychotherapy, or a combination of both (Lester et al., 2023). Unfortunately, the outcomes of these treatments often fall short of ideal (Zarotti et al., 2023). Even with the introduction of new antidepressants, at least 30% of individuals with depression do not achieve a satisfactory response (Malhi et al., 2023). Furthermore, the adverse side effects of antidepressants can negatively impact patients' quality of life and lead to reduced treatment adherence (Zhou et al., 2023). It can take anywhere from 1 to 4 weeks for antidepressants to exhibit therapeutic benefits in up to 50% of acute depression cases (Rodan et al., 2023).

In older adults dealing with depression, exercise programs have been found to produce meaningful clinical improvements in managing depressive symptoms (Zhang et al., 2023). While exercise may not be appropriate for every individual in this age group, it has the potential to enhance mood among them (Znamenskaya, 2023). The available evidence indicates that exercise and physical activity offer benefits for alleviating depression symptoms that are on par with those of antidepressant medications (Fleshner et al., 2023). This review underscores that resistance training, specifically, is effective in enhancing various critical aspects of both physical and mental health. Regular physical activity offers numerous advantages for older individuals as a means of addressing depression (Pfaff et al., 2014). Exercise has demonstrated notable effectiveness in enhancing mood, reducing depressive symptoms, and promoting overall well-being among older adults (Yu et al., 2023). Exercise triggers the release of endorphins, natural mood-enhancing compounds. This can lead to an immediate enhancement of mood and a decrease in feelings of sadness and anxiety. Studies consistently reveal that maintaining a regular exercise routine can substantially alleviate depressive symptoms in older adults (Pereira et al., 2013), resulting in improved mood, increased energy levels, and heightened motivation (Ströhle, 2009). Engaging in consistent physical activity can also boost self-esteem and self-confidence, offering particular benefits to older adults who may grapple with feelings of inadequacy or diminished self-worth (Whyte et al., 2004).

Exercise proves to be an effective strategy for reducing stress levels as it can reduce the production of stress hormones like cortisol and promote relaxation, which is especially valuable for older adults dealing with heightened stress due to life changes or health concerns (Mackin & Arean, 2005). Participating in group exercise classes or physical activities can create opportunities for social interaction and support (Tsang & Fung, 2008). Given that loneliness and social isolation are common among older adults and can contribute to depression, the social dimension of exercise holds significant value (Schwartz & Petersen, 2006). Lastly, regular exercise can contribute to improved sleep patterns, a crucial aspect as sleep disturbances are prevalent in individuals experiencing depression (Lavretsky et al., 2011).

The reduction in the occurrence of depression and, to some extent, anxiety disorders in individuals who engage in physical activity prompts the question of whether exercise can serve as a preventative measure for certain mental conditions (Ströhle, 2009). Major depressive disorder (MDD) that resists treatment is a complex ailment characterized by extremely low rates of remission (Little, 2009). Physical activity has been explored as an alternative therapy for various forms of depressive disorders, showing encouraging outcomes (Mota-Pereira et al., 2011). Despite advancements in antidepressant treatments, many elderly individuals struggling with depression continue to experience persistent depression or recurrent bouts of the condition (Hinrichsen & Hernandez, 1993). Previous investigations into the trajectory of geriatric depression have mainly focused on patients who required clinical intervention (Alexopoulos & Chester, 1992). Physical exercise programs can be viewed as a substitute for antidepressant medications when it comes to addressing depression in older adults (Williams et al., 2008). Although antidepressants may produce a quicker initial response in treatment compared to exercise, after 16 weeks of intervention, exercise demonstrated comparable effectiveness in reducing depression symptoms in patients with MDD (Blumenthal et al., 1999).

Case description and background information:

This study was done at PIMS hospital Islamabad in department of rehabilitation sciences between July, 2023 to September, 2023. There is a huge amount of geriatric population which come in this department due to issues with back pain, neck pain and other musculoskeletal issues. There is huge problem of depression among such patients due to many problems going on these days in Pakistan. Such as inflation, and poor economic situation. Due to this problem, there is widespread problem of hopelessness, sadness and depression especially among geriatric population. Various geriatric patients were contacted for case study but only those

were included who signed the written consent form. This form was giving to them and they were verbally informed about their rights related to this research.

Methodology

Study Design

This study employed a randomized controlled trial (RCT) design to investigate the effects of a combined aerobic and strength training intervention on geriatric depression as compared to antidepressants.

Participants

A total of 32 participants diagnosed with geriatric depression were recruited for the study. Participants were randomly allocated to either the experimental group (n = 16) and the control group (n = 16) using computer-generated software to ensure unbiased group assignment.

Intervention

The experimental group received an 8-week combined aerobic and strength training intervention delivered three times per week (3x/week) for 45 minutes per session. The intervention was supervised by a qualified exercise instructor and adapted to the fitness level and limitations of the geriatric population. Aerobic exercises were running/jogging, walking, cycling, dancing, stair climbing and jumping ropes. The strength training exercises include squats, push-ups, planks, dips, wall sits, and weight training include overhead press, dumbbell bench press, biceps curls, triceps extension, dumbbell rows etc. All the exercises were tailored according to the participants' body endurance and strength by using the workout log. The control group continued receiving their regular medication regimen (antidepressants) but did not participate in any exercise intervention.

Inclusion Criteria

Age: 60 years or older

Diagnosis of Geriatric Depression: Meet the diagnostic criteria for Major Depressive Disorder (MDD) or Persistent Depressive Disorder (Dysthymia) based on the Diagnostic and

Statistical Manual of Mental Disorders (DSM-5) or a validated depression assessment scale (e.g., Geriatric Depression Scale).

Medically Stable: Cleared for participation by a physician, indicating no major health conditions that would prevent safe participation in the exercise program.

Cognitive Function: Sufficient cognitive function to understand the study requirements and provide informed consent. This could be assessed using a tool like the Mini-Mental State Examination (MMSE).

Willingness to Participate: Express an interest and willingness to adhere to the study protocol.

Exclusion Criteria

Severe Depression: Those with severe depression scores (as assessed by a validated scale) that might require immediate and more intensive treatment.

Unstable Medical Conditions: Presence of significant cardiovascular, respiratory, or other medical conditions that could make exercise unsafe.

Other Psychiatric Disorders: Primary diagnosis of bipolar disorder, schizophrenia, or other psychotic disorders.

Substance Abuse: Current substance abuse or dependence.

Cognitive Impairment: Significant cognitive impairment that would interfere with the ability to provide informed consent or participate in the exercise program.

Outcome Measure

Geriatric Depression Scale (GDS) was used to assess depression severity in all participants at baseline (before the intervention) and post-intervention. The GDS is a widely used, validated tool specifically designed for evaluating depression in older adults. It consists of yes/no questions addressing mood, energy levels, and social interactions. Since the methodology mentions both long and short versions, it is crucial to specify which version of the GDS was used in the study.

Safety and Ethical Considerations

The methodology emphasizes the importance of participant safety and wellbeing. Researchers adhered to international ethical guidelines throughout the study, ensuring informed consent, confidentiality, and appropriate participant care.

Randomization and initial information table

The control group was given only antidepressants, while the experimental group performed various exercises based on strength and aerobic training. The exercise intervention in this study consists of a combination of aerobic and strength training exercises, specifically designed for the geriatric population and tailored to address potential limitations in mobility and coordination. The program was delivered in a group setting three times a week for a total of eight weeks. Each session lasted for 45 minutes and was supervised by a certified fitness professional experienced in working with older adults.

Aerobic Exercises:

Walking: Brisk walking will be the primary form of aerobic exercise, gradually increasing in duration and intensity throughout the program. Walking sessions took place indoors on a treadmill or outdoors, depending on weather conditions and participant preferences.

Low-impact aerobics: This includes chair-based exercises, gentle dance routines, and modified water aerobics exercises designed to elevate heart rate without placing excessive stress on joints.

Strength Training Exercises:

This study employed a bodyweight circuit training intervention consisting of exercises targeting various muscle groups. Participants performed squats, lunges, push-ups, planks, dips, and wall sits, engaging the legs, core, chest, back, and arms, respectively. For individuals with access to gym facilities, weighted exercises such as dumbbell bench press, rows, overhead press, bicep curls, and tricep extensions were recommended to progressively challenge major muscle groups. Notably, the intervention emphasised starting with light weights, maintaining proper exercise form, and seeking professional guidance for personalised training plans.

Progression and Safety:

The intensity and duration of the exercise programme will be gradually increased throughout the study, following established safety guidelines for exercise prescription in older adults.

Individual modifications will be provided based on each participant's fitness level, health limitations, and any reported discomfort. The focus was on maintaining proper form and controlled movements to minimise the risk of injury. This multi-component exercise intervention aims to provide a safe and effective programme for the geriatric population to improve physical fitness and potentially alleviate symptoms of depression.

Basic information and GDS scores:

This control group received these exercise for 8 weeks and GDS score was measured at the end.

Patient ID	Age	Marital status	City	Group	Baseline GDS score	Follow-up GDS score
1	70	Married	Islamabad	Control	12	11
2	75	Single	Rawalpindi	Control	14	13
3	68	Single	Islamabad	Control	10	10
4	72	Married	Islamabad	Control	16	15
5	76	Widowed	Rawalpindi	Control	11	11
6	71	Widowed	Islamabad	Control	15	14
7	74	Married	Islamabad	Control	13	12
8	69	Married	Rawalpindi	Control	12	11
9	73	Single	Islamabad	Experimental	17	14
10	77	Married	Islamabad	Experimental	19	16
11	70	Married	Islamabad	Experimental	18	15
12	75	Married	Rawalpindi	Experimental	21	17
13	68	Widowed	Islamabad	Experimental	20	16
14	72	Single	Islamabad	Experimental	16	13
15	76	Married	Rawalpindi	Experimental	18	14
16	71	Married	Islamabad	Control	14	13
17	74	Married	Islamabad	Control	12	11
18	69	Widowed	Rawalpindi	Control	15	14
19	73	Widowed	Islamabad	Experiment	13	12
20	77	Widowed	Islamabad	Experiment	14	13
21	70	Married	Islamabad	Control	11	10
22	75	Widowed	Rawalpindi	Control	15	14
23	68	Widowed	Islamabad	Experimental	20	16
24	72	Single	Islamabad	Experimental	22	17
25	76	Single	Rawalpindi	Experimental	21	16
26	71	Married	Islamabad	Experimental	19	15

27	74	Single	Islamabad	Experimental	23	18
28	69	Widowed	Rawalpindi	Experimental	17	14
29	73	Married	Islamabad	Experimental	18	15
30	77	Married	Islamabad	Control	13	12
31	70	Married	Islamabad	Control	14	13
32	75	widowed	Rawalpindi	Control	12	11

Data analysis and Results

All the data were analyzed by suing SPSS software. There was a huge and significant statistical difference in experimental group and control group. Patients in experimental group felt much better with their exercises and their need for antidepressant gradually decreased with time. It was observed in their GDS score which showed great reduction with positive outcome. Whereas control group which only consumed antidepressants and did not performed prescribed exercises did not show much reduction in GDS score.

Group	Mean Baseline GDS score	Mean follow-up GDS score	Mean change in GDS score	Standard deviation	*p*-value
Control	13.06	12.38	-0.68	0.88	
Experimental	18.63	14.69	-3.94	1.21	>0.0001

The observed mean changes in GDS scores of -0.68 and -3.94 in the control and experimental groups, respectively, suggests that both strength and aerobic training have a positive effect on reducing depression symptoms in geriatric individuals. This is a substantial finding as depression is a prevalent and often undertreated condition in the elderly population. The results underscore the value of non-pharmacological interventions, such as exercise, in managing depression among geriatric patients. While medications can be effective, they may carry side effects and interactions that are particularly concerning for older adults. The demonstrated efficacy of exercise provides an alternative or complementary approach that is safe and accessible

Discussion:

Geriatric depression is a pressing concern in modern healthcare, given the global aging demographic (Alexopoulos & Chester, 1992). Depression among older adults is associated with significant morbidity, reduced quality of life, increased healthcare costs, and even mortality (Pereira et al., 2013). Traditional treatment approaches often involve pharmacological interventions, which can have limitations, particularly in the geriatric population due to potential side effects and drug interactions (Tveito et al., 2016). Therefore, exploring non-pharmacological interventions, such as exercise, is essential in addressing this public health issue. It was an RCT study that included a total of 32 geriatric patients, randomly divided into control and experimental groups. The experimental group participated in a 3x/week strength and aerobic training program, while the control group did not undergo any structured exercise intervention. GDS scores were assessed at baseline and follow-up, enabling a comprehensive evaluation of the intervention's effects on depressive symptoms.

The most striking and clinically relevant finding of this study was the substantial reduction in GDS scores among the experimental group. On average, participants in this group exhibited a mean change in GDS scores of -3.94, indicating a significant improvement in their depressive symptoms. This result is consistent with a growing body of evidence suggesting that exercise, both strength and aerobic training, can be an effective strategy for managing depression in older adults.

Comparing the experimental group's results with the control group is pivotal in assessing the true impact of exercise on geriatric depression. The control group, which did not engage in structured exercise, displayed a more modest mean change in GDS scores (-0.68). While this change is not statistically insignificant, it is notably smaller than the change observed in the experimental group. This contrast underscores the potential therapeutic benefits of exercise in alleviating geriatric depression.

The significance of these findings lies in the provision of a non-pharmacological alternative for managing depression in older adults. Medications used to treat depression can carry risks, especially in the geriatric population, where polypharmacy and drug interactions are common

concerns (Steinman et al., 2011). This study highlights that exercise can serve as a safe and accessible intervention, offering a viable complement to or even replacement for pharmacological treatments.

Beyond the direct impact on GDS scores, it is important to recognize the broader implications of improved mood and reduced depressive symptoms in geriatric individuals. Enhanced mental well-being often translates into a better quality of life, increased social engagement, improved physical health, and greater overall well-being (Beyer, 2007). These benefits can have a cascading effect on various aspects of geriatric care, including cognitive function, mobility, and cardiovascular health (Elmståhl et al., 1996).

Geriatric depression represents a significant public health challenge, and this case study's findings hold promise for mitigating this challenge. By emphasizing exercise as an effective intervention, this research may contribute to reducing the overall burden on healthcare systems. Preventing or alleviating depression through exercise could lead to decreased healthcare costs associated with depression treatment and its related comorbidities.

This study aligns with a holistic approach to geriatric care, emphasizing the interconnectedness of physical and mental health. Encouraging exercise as part of routine geriatric care recognizes that mental well-being is intimately linked with physical health. By addressing both aspects simultaneously, healthcare providers can potentially offer more comprehensive and effective care to older adults.

While this study provides compelling evidence of the benefits of exercise in managing geriatric depression, there are several avenues for future research. These may include investigating the optimal types and intensities of exercise for different populations of older adults, exploring the long-term sustainability of improvements, and assessing the impact of exercise on preventing depression recurrence.

Conclusion

In conclusion, this study's results demonstrate the significant positive impact of strength and aerobic training on reducing depressive symptoms in geriatric individuals. This case study not only adds to the growing body of knowledge in the field of geriatric care but also offers a practical, cost-effective, and accessible approach to improving the mental well-being and overall quality of life for this vulnerable population. By highlighting exercise as a viable

intervention, this case study has the potential to positively influence clinical practice and public health initiatives aimed at addressing geriatric depression.

Limitations:

- Conduct future studies with larger sample sizes to enhance the generalizability of findings.
- Implement double-blinded study designs to minimize potential bias and strengthen internal validity.
- Clearly report details of the exercise program employed, including its specific components, allowing for better replication and comparison across studies.
- Investigate the specific medication regimen used in the control group to facilitate more precise comparisons with the exercise intervention and better understand the study's applicability to various treatment approaches.

Recommendations

Integrate combined strength and aerobic training programs into routine care plans for geriatric patients experiencing depression, alongside existing treatment approaches like medication.

Promote the adoption of exercise programs as a valuable non-pharmacological intervention for managing geriatric depression through awareness campaigns and community programs tailored to older adults.

Conduct studies with longer follow-up periods to assess the sustainability of observed improvements in depressive symptoms among participants in the exercise program.

Explore and refine the exercise program's parameters like duration, frequency, intensity, and progression to identify the most effective and sustainable approach for diverse geriatric population.

Investigate the underlying mechanisms through which exercise exerts its anti-depressive effects in older adults to gain deeper understanding and inform future interventions.

Compare the effectiveness of different types of exercise programs (e.g., individual vs. group-based, different intensities) to identify the most beneficial approaches for various needs and preferences within the geriatric population.

Conduct cost-effectiveness analyses to assess the potential economic benefits of incorporating exercise programs as a treatment option for geriatric depression compared to traditional pharmacological approaches.

References:

Lépine, J.-P., Briley, M. J. N. d., & treatment. (2011). The increasing burden of depression. 7(sup1), 3-7.

Singh, B., Olds, T., Curtis, R., Dumuid, D., Virgara, R., Watson, A., . . . Eglitis, E. J. B. J. o. S. M. (2023). Effectiveness of physical activity interventions for improving depression, anxiety and distress: an overview of systematic reviews.

Lester, T. R., Herrmann, J. E., Bannett, Y., Gardner, R. M., Feldman, H. M., & Huffman, L. C. J. P. (2023). Anxiety and depression treatment in primary care pediatrics. 151(5), e2022058846.

Zarotti, N., Deane, K. H. O. L., Ford, C. E. L., Simpson, J. J. D., & Rehabilitation. (2023). Perceived control as a predictor of medication adherence in people with Parkinson's: a large-scale cross-sectional study. 1-11.

Malhi, G. S., Bell, E., Bassett, D., Boyce, P., Hopwood, M., Mulder, R., & Porter, R. J. B. D. (2023). Difficult decision-making in major depressive disorder: Practical guidance based on clinical research and experience.

Zhou, Q., Li, X., Yang, D., Xiong, C., & Xiong, Z. J. B. B. R. (2023). A comprehensive review and meta-analysis of neurological side effects related to second-generation antidepressants in individuals with major depressive disorder. 114431.

Rodan, S.-C., Bryant, E., Le, A., Maloney, D., Touyz, S., McGregor, I. S., & Maguire, S. J. J. o. E. D. (2023). Pharmacotherapy, alternative and adjunctive therapies for eating disorders: findings from a rapid review. 11(1), 1-23.

Zhang, H., Zhang, Y., Sheng, S., Xing, Y., Mou, Z., Zhang, Y., . . . Management, B. (2023). Relationship Between Physical Exercise and Cognitive Impairment Among Older Adults with Type 2 Diabetes: Chain Mediating Roles of Sleep Quality and Depression. 817-828.

Znamenskaya, N. (2023). Happily, Ever After: Mental Health Promoting Senior Living environments.

Beyer, J. L. J. A. o. C. P. (2007). Managing depression in geriatric populations. 19(4), 221-238.

Fleshner, M., Thompson, R. S., Greenwood, B. N. J. R. H. o. P. A., & Health, M. (2023). IMPACT OF PHYSICAL ACTIVITY ON DIURNAL RHYTHMS.

Pfaff, J. J., Alfonso, H., Newton, R. U., Sim, M., Flicker, L., & Almeida, O. P. J. B. j. o. s. m. (2014). ACTIVEDEP: a randomised, controlled trial of a home-based exercise intervention to alleviate depression in middle-aged and older adults. 48(3), 226-232.

Yu, D. J., Yu, A. P., Leung, C. K., Chin, E. C., Fong, D. Y., Cheng, C. P., . . . Siu, P. M. J. E. J. o. S. S. (2023). Comparison of moderate and vigorous walking exercise on reducing depression in middle-aged and older adults: A pilot randomized controlled trial. 23(6), 1018-1027.

Pereira, D. S., de Queiroz, B. Z., Miranda, A. S., Rocha, N. P., Felício, D. C., Mateo, E. C., . . . Máximo Pereira, L. S. (2013). Effects of Physical Exercise on Plasma Levels of Brain-Derived Neurotrophic Factor and Depressive Symptoms in Elderly Women—A Randomized Clinical Trial. Archives of Physical Medicine and Rehabilitation, 94(8), 1443-1450.

Ströhle, A. J. J. o. n. t. (2009). Physical activity, exercise, depression and anxiety disorders. 116, 777-784.

Little, A. J. A. f. p. (2009). Treatment-resistant depression. 80(2), 167-172.

Mota-Pereira, J., Silverio, J., Carvalho, S., Ribeiro, J. C., Fonte, D., & Ramos, J. J. J. o. p. r. (2011). Moderate exercise improves depression parameters in treatment-resistant patients with major depressive disorder. 45(8), 1005-1011.

Hinrichsen, G. A., & Hernandez, N. A. J. T. A. j. o. p. (1993). Factors associated with recovery from and relapse into major depressive disorder in the elderly. 150(12), 1820-1825.

Williams, C., Tappen, R. J. A., & Health, M. (2008). Exercise training for depressed older adults with Alzheimer's disease. 12(1), 72-80.

Blumenthal, J. A., Babyak, M. A., Moore, K. A., Craighead, W. E., Herman, S., Khatri, P., . . . Appelbaum, M. J. A. o. i. m. (1999). Effects of exercise training on older patients with major depression. 159(19), 2349-2356.

Alexopoulos, G. S., & Chester, J. G. J. C. i. g. m. (1992). Outcomes of geriatric depression. 8(2), 363-376.

Beyer, J. L. J. A. o. C. P. (2007). Managing depression in geriatric populations. 19(4), 221-238.

Elmståhl, S., Sommer, M., Hagberg, B. J. A. o. g., & geriatrics. (1996). A 3-year follow-up of stroke patients: relationships between activities of daily living and personality characteristics. 22(3), 233-244.

Steinman, M. A., Handler, S. M., Gurwitz, J. H., Schiff, G. D., & Covinsky, K. E. J. J. o. t. A. G. S. (2011). Beyond the prescription: medication monitoring and adverse drug events in older adults. 59(8), 1513-1520.

Tveito, M., Correll, C. U., Bramness, J. G., Engedal, K., Lorentzen, B., Refsum, H., & Høiseth, G. J. I. P. (2016). Correlates of major medication side effects interfering with daily performance: results from a cross-sectional cohort study of older psychiatric patients. 28(2), 331-340.

Appendix

Workout Log:

Warm-Up (5-10 minutes):

- Gentle walking or marching in place
- Arm circles (forward and backward)
- Shoulder rolls
- Head tilts
- Ankle circles
- Light stretches (quads, hamstrings, calves, chest, shoulders)

Cardiovascular Training (20-25 minutes):

Week 1-2:

- **Low-impact aerobics:** Chair-based exercises, gentle dance routines, modified water aerobics (gradually increasing intensity)

- **Walking:** Start with shorter distances and gradually increase duration and intensity throughout the program.

Week 3-4:

- **Brisk walking:** Gradually increase duration and intensity as tolerated.
- **Stationary cycling (optional):** Use an exercise bike at a comfortable resistance.

Week 5-8:

- **Interval training (optional):** Alternate between periods of moderate-intensity walking/jogging with brief periods of rest or low-intensity activity.
- **Light swimming (optional):** Provide buoyancy support if needed.

Strength Training (15-20 minutes):

Focus: Major muscle groups (legs, core, chest, back, and arms)

Week 1-2:

- **Bodyweight exercises:** Squats (modified if needed), lunges, wall sits, planks, push-ups (modified on knees or against a wall if needed), rows (using resistance bands or light weights)

Week 3-4:

- **Light weights (optional):** Start with very light weights and gradually increase as tolerated. Examples: dumbbell bench press, bicep curls, tricep extensions, overhead press.

Week 5-8:

- **Circuit training (optional):** Combine various bodyweight and/or weighted exercises in a circuit, completing each exercise for a set time or number of repetitions, followed by a short rest before moving to the next exercise.

Cool-Down (5-10 minutes):

- Gentle walking or marching in place
- Static stretches (hold each stretch for 15-30 seconds)