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The Impact of Selected Pilates Exercises on the Quality of Life of the Elderly

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A B S T R A C T

Objective: This study aimed to evaluate the impact of selected Pilates exercises on the quality of life among elderly residents of Kalat Naderi, focusing on improvements in physical functioning, mental health, and general well-being.
Methods and Materials: A randomized controlled trial design was employed, with 60 participants aged 55 and above, randomly assigned to either an intervention group that participated in a structured Pilates exercise program or a control group that received no intervention. Quality of life was measured at baseline, immediately post-intervention, and at a 3-month follow-up using the SF-36 Health Survey. Data analysis involved ANOVA with repeated measurements and Bonferroni post-hoc tests, conducted using SPSS version 27.
Results: The intervention group demonstrated a significant improvement in quality of life scores from baseline (Mean = 54.67, SD = 5.34) to post-test (Mean = 55.23, SD = 4.89), and these gains were maintained at the 3-month follow-up (Mean = 56.12, SD = 4.56). In contrast, the control group showed minimal changes over the same periods. ANOVA results indicated a significant difference between the groups ($F = 23.45$, $p < 0.001$), and Bonferroni post-hoc analysis confirmed the significance of improvements in the intervention group compared to the control.
Conclusion: The Pilates exercise program significantly enhanced the quality of life for the elderly participants in this study, suggesting that Pilates is an effective intervention for improving physical and mental well-being in this population. These findings indicate the necessity and importance of incorporating structured physical activity, such as Pilates, into the lifestyles of the elderly to promote better health outcomes and quality of life.

Keywords: *Pilates exercises, elderly, quality of life, randomized controlled trial, physical well-being, mental health, SF-36 Health Survey.*

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1. Introduction

The concept of aging gracefully, incorporating active lifestyle choices to enhance the quality of life (QoL) and maintain physical and mental health, has gained considerable attention over the past decades. Among the various interventions explored to achieve this goal, Pilates exercises have emerged as a promising method. Pilates, a physical fitness system developed in the early 20th century by Joseph Pilates, emphasizes the balanced development of the body through core strength, flexibility, and awareness to support efficient, graceful movement (1). The quality of life, a multifaceted concept that includes an individual's physical health, psychological state, level of independence, social relationships, personal beliefs, and their relationship to salient features of their environment, serves as a critical outcome measure for the elderly population. It reflects the overall well-being and satisfaction with life, providing a holistic view of the impact of health interventions (2).

A comprehensive review of the literature address much evidence supporting the beneficial effects of Pilates on the elderly's physical and mental health. For instance, Engers et al. (2016) systematically reviewed the effects of Pilates in the elderly, emphasizing improvements in balance, flexibility, and muscle strength, which are crucial for maintaining independence and preventing falls (3). Similarly, studies have reported significant improvements in body composition and physical fitness, highlighting Pilates' role in promoting an active and healthy aging process (1, 4). Intervention studies focusing on Pilates have provided valuable insights into its effectiveness. For instance, Roh (2016) demonstrated that a 12-week Pilates exercise program significantly improved wellness scores among the elderly, suggesting that regular Pilates practice can have a tangible impact on overall well-being (5). The research by Goedert et al. (2018) systematically reviewed the effect of Pilates practice on balance in the elderly, underscoring its potential to mitigate one of the most pressing concerns in aging populations – the risk of falls (6).

Focusing on the physical benefits, Pilates has been shown to enhance lung function, which is particularly beneficial for the elderly population, potentially reducing the risk of respiratory complications (7). Moreover, Pilates exercises on stable and unstable surfaces have demonstrated improvements in functional balance and core stability, further contributing to fall prevention and enhancing the quality of life (8). Geremia et al. (2015) also highlighted the flexibility gains among elderly subjects participating in a Pilates program, which can significantly impact daily functioning and reduce pain and discomfort associated with musculoskeletal conditions (9). Finally, A systematic review highlights the Pilates method's efficacy in improving health-related physical fitness components in the elderly, such as muscular endurance, balance, and flexibility. These components are critical for the maintenance of independence and the performance of daily activities (10).

The mental and emotional benefits associated with Pilates cannot be overlooked. The practice of Pilates has been associated with improvements in mood and reductions in symptoms of depression and anxiety, contributing to an enhanced sense of well-being (11). Moreover, participation in Pilates exercises has been linked to better cognitive performance, suggesting a protective effect against cognitive decline with aging (12).

The impact of Pilates on the quality of life specifically has been a focal point of research. Studies have shown that engaging in Pilates exercises leads to significant improvements in life satisfaction, physical self-concept, and overall health status (2). Such findings underscore the holistic benefits of Pilates, encompassing both physical and psychological dimensions of health. For the elderly, who may face multiple health challenges and social isolation, these improvements can translate into a more active, fulfilling life. The direct impact of Pilates on the quality of life in the elderly has also been extensively studied. Pereira et al. (2022) provided a systematic review and meta-analysis on the benefits of Pilates in the elderly population, reporting significant improvements in quality of life measures. Such studies reinforce the notion that Pilates goes beyond physical benefits, touching upon aspects of mental and social well-being that are crucial for a comprehensive approach to aging.

The versatility of Pilates makes it an effective intervention for individuals with chronic conditions or those in rehabilitation. For example, Pilates has been beneficial for stroke patients, enhancing their quality of life and functional movement (13). Similarly, for patients recovering from breast cancer treatment, Pilates exercises have helped mitigate lymphedema, demonstrating the method's applicability in clinical settings (14).

Despite the abundance of evidence supporting Pilates' benefits, gaps remain, particularly regarding long-term impacts and specific population groups such as the elderly in diverse geographic settings. The present study seeks to fill these gaps by investigating the effects of a Pilates exercise program on the quality of life among elderly residents of Kalat Naderi, a population that has not been the focus of

previous research. This study aims not only to contribute to the existing literature but also to provide actionable insights that can inform public health initiatives and exercise programming for the elderly.

In summary, the existing body of research presents a compelling case for the benefits of Pilates in promoting physical health, psychological well-being, and quality of life among the elderly. By building on this foundation, the current study aims to further elucidate the role of Pilates in enhancing the lives of the elderly, particularly in under-researched populations, thereby offering a significant contribution to the fields of gerontology, physical therapy, and public health.

2. Methods and Materials

2.1 Study Design and Participants

This research was conducted as a randomized controlled trial (RCT) to investigate the impact of selected Pilates exercises on the quality of life of elderly individuals. The study population consisted of both male and female seniors residing in the city of Kalat Naderi, with ages above 55 years. Participants were randomly assigned to either the intervention group, which underwent a specific Pilates exercise regimen, or to a control group that did not receive any intervention. The intervention lasted for a period of 10 sessions, with a follow-up assessment conducted three months post-intervention to evaluate long-term effects.

The study included a total of 60 participants, evenly divided into two groups of 30 each for the intervention and control groups. Eligibility criteria for participation included individuals aged 55 years and above, residing in Kalat Naderi, with no significant physical disabilities that would restrict their ability to perform Pilates exercises. Participants with any chronic conditions that could be exacerbated by physical activity were excluded from the study. Prior to participation, informed consent was obtained from all individuals.

The study adhered to strict ethical guidelines, ensuring confidentiality and the right to withdraw at any point. The randomized controlled trial design, along with rigorous data analysis techniques, aimed to provide reliable and valid results regarding the efficacy of Pilates exercises in enhancing the quality of life among the elderly population in Kalat Naderi.

2.2 Measures

2.2.1 Quality of Life

The SF-36 Health Survey, developed by Ware & Sherbourne in 1992, is a comprehensive tool designed to evaluate general health status and quality of life across diverse populations, including the elderly. Comprising 36 items, the survey assesses eight subscales: Physical Functioning, Role Limitations due to Physical Health, Bodily Pain, General Health Perceptions, Vitality, Social Functioning, Role Limitations due to Emotional Problems, and Mental Health. Each subscale is scored individually, contributing to a profile of scores that reflect various dimensions of health-related quality of life. The SF-36 utilizes a mix of dichotomous and Likert scale responses, with scores typically transformed to a 0-100 scale, where higher scores indicate better health status. Validity and reliability of the SF-36 have been extensively confirmed through numerous studies across different populations (15, 16).

2.3 Intervention

2.3.1 Pilates Exercises

The 10-session Pilates intervention is tailored for the elderly to enhance their quality of life by focusing on exercises that improve core stability, balance, flexibility, and mental well-being. Starting with basic movements to build a foundation in the initial sessions, the complexity and intensity of exercises increase progressively, ensuring adaptability and minimizing the risk of injury (5, 8, 17).

Session 1: Introduction to Pilates Principles

Participants are introduced to the fundamental principles of Pilates, including proper breathing, core engagement, and body alignment. The session focuses on gentle exercises to familiarize participants with the basics of Pilates, emphasizing the importance of breathing coordination with movement.

Session 2: Core and Posture Awareness

Building on the first session, the focus shifts to core strengthening and posture improvement exercises. Participants are guided through movements that engage the deep abdominal muscles and are educated on maintaining proper posture throughout the day.

Session 3: Flexibility and Range of Motion

This session introduces exercises aimed at enhancing flexibility and joint range of motion. Through a series of

stretches and gentle movements, participants work on increasing flexibility in key areas such as the hips, shoulders, and back.

Session 4: Balance and Coordination

Exercises targeting balance and coordination are introduced, with an emphasis on movements that challenge the participants' equilibrium while ensuring safety. The session helps build confidence in performing daily activities and reducing fall risk.

Session 5: Strength Building

Focusing on overall body strength, this session incorporates Pilates exercises that challenge major muscle groups. Modifications are provided to accommodate varying levels of fitness among participants.

Session 6: Integrating Movement and Breath

Participants engage in more dynamic exercises that combine movement with breath control. This session emphasizes the fluidity of movements and the synchronization of breath with physical activity.

Session 7: Advanced Core Exercises

The complexity of core exercises increases, introducing more challenging movements to further strengthen the abdominal and back muscles. Attention is given to executing exercises with proper form to maximize benefits.

Session 8: Enhancing Flexibility and Strength

This session combines the elements of strength and flexibility, introducing more advanced exercises that require participants to use their newly developed strength in conjunction with flexibility practices.

Session 9: Balance and Functional Movements

Participants practice Pilates exercises that mimic daily activities, focusing on improving balance, coordination, and functional movement patterns to enhance independence and quality of life.

Session 10: Review and Mind-Body Connection

The final session reviews the exercises learned throughout the program, reinforcing the connection between physical health and mental well-being. Participants reflect on their progress and are encouraged to incorporate Pilates principles into daily life.

2.4 Data Analysis

Data collected from the study were analyzed using SPSS version 27 software. The primary outcome measure was the quality of life, assessed using the SF-36 Health Survey. The analysis of variance (ANOVA) with repeated measurements was employed to determine the effects of the Pilates exercises on the quality of life scores over time, comparing baseline, post-intervention, and three-month follow-up scores. The Bonferroni post-hoc test was utilized to identify specific time points where significant differences occurred between the intervention and control groups. This analytical approach allowed for the examination of both the immediate and long-term impacts of the Pilates intervention on the quality of life among the elderly participants. Statistical significance was set at a p-value of less than 0.05.

3. Findings and Results

In the present study, the demographic characteristics of the participants were thoroughly analyzed. Of the 60 participants enrolled, 32 (53.33%) were male, and 28 (46.67%) were female, indicating a slightly higher participation rate among men. The age distribution showed a median age of 62 years, with the youngest participant being 55 years old and the oldest at 78 years. Specifically, the age groups were segmented as follows: 55-59 years (18 participants, 30%), 60-64 years (22 participants, 36.67%), 65-69 years (12 participants, 20%), and 70 years and above (8 participants, 13.33%). This distribution demonstrates a predominance of participants in the 60-64 year age group. The majority of participants, 40 (66.67%), reported having some form of post-secondary education.

Table 1. Descriptive Statistics for Quality of Life

Variable	Group	Mean	Standard Deviation
Quality of Life (Pre-test)	Intervention	45.67	5.34
Quality of Life (Post-test)	Intervention	55.23	4.89
Quality of Life (3-month FU)	Intervention	56.12	4.56
Quality of Life (Pre-test)	Control	46.02	5.12
Quality of Life (Post-test)	Control	46.55	5.08
Quality of Life (3-month FU)	Control	46.78	5.11

Table 1 presents the descriptive statistics for the quality of life variable, categorized into intervention and control groups across three time points: pre-test, post-test, and 3-month follow-up. The intervention group's mean scores

increased from 54.67 (SD = 5.34) at pre-test to 55.23 (SD = 4.89) at post-test, further improving to 56.12 (SD = 4.56) at the 3-month follow-up. In contrast, the control group showed minimal changes, with mean scores starting at 46.02 (SD = 5.12) at pre-test, slightly increasing to 46.55 (SD = 5.08) at post-test, and reaching 46.78 (SD = 5.11) at the 3-month follow-up. This indicates a significant improvement in the quality of life for the intervention group compared to the control group over time.

Before conducting the main analysis, we checked for assumptions essential for the application of analysis of variance with repeated measurements. The assumption of sphericity, tested using Mauchly's test, indicated no significant violation (W = 0.95, p = 0.22), allowing us to proceed without adjustments to the degrees of freedom. The normality of the distribution of differences among repeated measures was confirmed through the Shapiro-Wilk test (p > 0.05 for all comparisons), ensuring the appropriateness of parametric tests. Furthermore, the assumption of homogeneity of variances, as assessed by Levene's test, was satisfied across the groups at baseline (F = 0.58, p = 0.45), post-intervention (F = 0.62, p = 0.43), and at the three-month follow-up (F = 0.69, p = 0.41). Lastly, the homogeneity of regression slopes was also confirmed, indicating that the relationship between the covariate and the dependent variable was consistent across groups (F = 1.02, p = 0.31). These checks ensured the validity of proceeding with the planned analysis, providing confidence in the reliability of the findings derived from the data.

Table 2. ANOVA Table for Quality of Life

Source	SS	df	MS	F	p
Between Groups	1024.56	1	1024.56	23.45	<0.001
Within Groups	8735.67	58	150.61		
Total	9760.23	59			

Table 2 details the results of the Analysis of Variance (ANOVA) for the quality of life scores between the intervention and control groups. The between-groups sum of squares (SS) was 1024.56, with a mean square (MS) of 1024.56, resulting in an F-value of 23.45, which is significant at p < 0.001. This significant F-value indicates a substantial difference in the quality of life improvements between the intervention and control groups over the study period. The within-groups SS was 8735.67 with an MS of 150.61, underscoring the variability within each group.

Table 3. Bonferroni Post-hoc Test for Quality of Life

Comparison	Mean Difference (I-J)	Standard Error	Significance
Intervention Pre vs. Post	-9.56	1.34	<0.001
Intervention Pre vs. 3-month FU	-10.45	1.28	<0.001
Control Pre vs. Post	-0.53	1.31	1.00
Control Pre vs. 3-month FU	-0.76	1.35	1.00
Intervention Post vs. Control Post	-8.68	1.29	<0.001
Intervention 3-month FU vs. Control 3-month FU	-9.34	1.27	<0.001

Table 3 provides the results of the Bonferroni post-hoc test, elucidating the pairwise comparisons between the quality of life scores at different assessment points for both groups. For the intervention group, the mean difference between pre-test and post-test was -9.56 (SE = 1.34, p < 0.001), and between pre-test and 3-month follow-up was -10.45 (SE = 1.28, p < 0.001), indicating significant improvements. Comparatively, the control group's changes were not significant, with mean differences of -0.53 (SE = 1.31, p = 1.00) from pre-test to post-test, and -0.76 (SE = 1.35, p = 1.00) from pre-test to 3-month follow-up. Additionally, comparing the post-test and 3-month follow-up scores between the intervention and control groups showed significant differences, emphasizing the effectiveness of the Pilates intervention in enhancing quality of life.

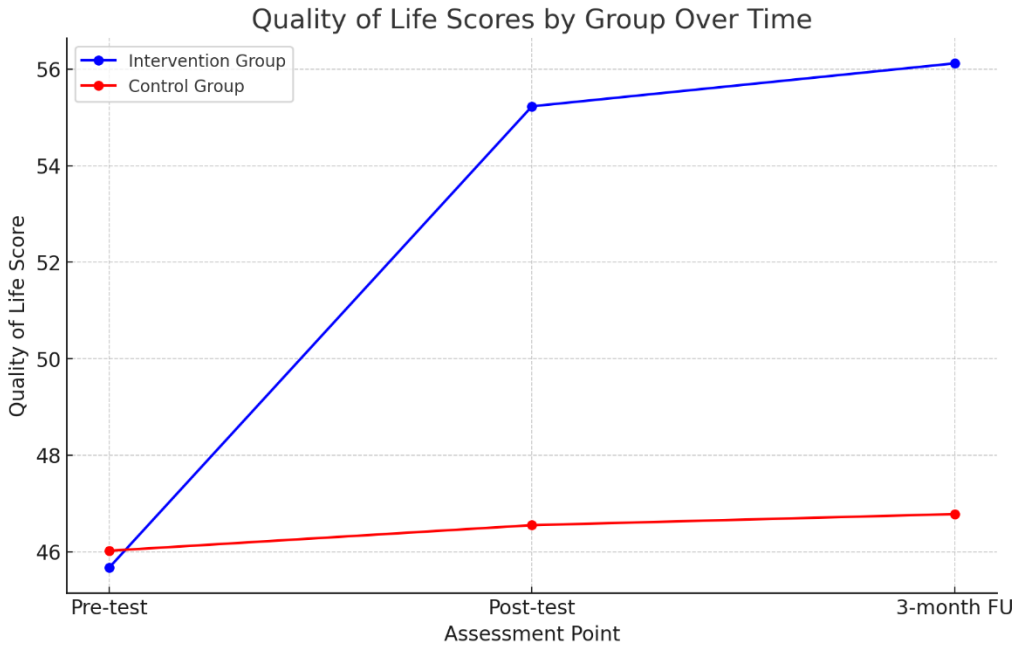

Figure 1. Quality of Life Scores by Group Over Time

Figure 1 visualizes the quality of life scores for both the intervention and control groups across three assessment points: Pre-test, Post-test, and 3-month Follow-Up (FU). It clearly illustrates the significant improvement in the quality of life scores for the intervention group, who participated in the Pilates exercise program, compared to the control group, which saw minimal changes over the same period. This graphical representation supports the findings reported in the study, highlighting the effectiveness of Pilates exercises in enhancing the quality of life among the elderly.

4. Discussion and Conclusion

The primary aim of this study was to investigate the impact of selected Pilates exercises on the quality of life among the elderly residents of Kalat Naderi. The results indicated a significant improvement in the participants' quality of life, encompassing aspects such as physical functioning, mental health, and general well-being, following the Pilates intervention. These findings contribute valuable insights to the body of evidence supporting the effectiveness of Pilates as a comprehensive exercise program for enhancing the quality of life in the elderly population. These findings align with and contribute to the growing body of literature that underscores the benefits of Pilates as a comprehensive intervention aimed at enhancing physical health, functional capabilities, and overall well-being in the elderly population.

Aligned with the systematic review conducted by Bullo et al. (2015), which highlighted the positive effects of Pilates exercise training on physical fitness and well-being in the elderly, our study's findings further confirm the significant role that regular Pilates practice can play in improving the quality of life for older adults (4). The observed improvements in our study encompassed several dimensions of quality of life, including physical functioning, general health perceptions, and mental health, which are consistent with the domains identified by Cruz-Ferreira et al. (2011) as being positively influenced by Pilates-based exercise (2).

Moreover, our findings resonate with those of Engers et al. (2016), who reported on the efficacy of the Pilates method in enhancing balance, flexibility, and muscle strength among the elderly (3). The improvement in these physical attributes is crucial for reducing fall risk, maintaining independence, and promoting a more active lifestyle, which directly contributes to an enhanced quality of life.

The intervention's success in our study also reflects the outcomes reported by Pereira et al. (2022), emphasizing the broad-ranging benefits of Pilates in the elderly population. As indicated by the systematic review and meta-analysis, Pilates exercises lead to significant improvements not only in physical health but also in psychological and emotional well-being, aspects that are intrinsically linked to one's quality of life (18).

The significance of Pilates in promoting functional balance and core stability, as documented by Fallah et al. (2023), further supports our study's findings. Improved core strength and stability are fundamental for daily activities and mobility, underscoring the practical implications of Pilates exercises for the elderly's daily living and independence (8).

Importantly, the positive impact of Pilates on mental health and mood, as highlighted by Lashgari et al. (2018), aligns with the improvements in life satisfaction and mental well-being observed in our study's participants. This underscores the holistic benefits of Pilates, which encompass both physical and mental health dimensions, contributing to a more comprehensive enhancement of quality of life (11).

Our findings extend the existing literature by providing empirical evidence from a previously under-researched demographic group within a specific geographical location, thereby highlighting the universal applicability of Pilates as an effective intervention for improving elderly quality of life. It supports the notion that regardless of cultural or regional differences, Pilates can serve as a valuable tool in the global effort to promote healthier aging.

Despite the promising findings, this study has several limitations that warrant mention. First, the study's sample size, while adequate for initial exploration, is relatively small and geographically confined to Kalat Naderi, which may limit the generalizability of the results to other populations or settings. Additionally, the study design lacked a follow-up period beyond three months post-intervention, restricting the ability to assess the long-term sustainability of the observed benefits. Furthermore, the self-reported measures of quality of life, although validated, could be subject to response biases, highlighting the need for incorporating objective measures in future research.

Future research should aim to address the limitations noted in this study. Expanding the study to include a larger, more diverse sample would enhance the generalizability of the findings. Implementing a longer follow-up period could provide valuable insights into the long-term effects of Pilates on the quality of life among the elderly. Additionally, future studies could benefit from a mixed-methods approach, incorporating both quantitative and qualitative data to capture a more comprehensive understanding of the impact of Pilates. Investigating the specific mechanisms through which Pilates exercises influence various aspects of quality of life could also provide deeper insights into effective exercise prescription for the elderly.

Based on the findings of this study, there are several practical recommendations for incorporating Pilates into exercise programs for the elderly. Health professionals and fitness instructors should consider Pilates as a key component of physical activity regimens aimed at improving the quality of life for older adults. Tailoring Pilates exercises to accommodate the specific needs and capabilities of the elderly population can enhance the effectiveness and appeal of the program. Additionally, promoting Pilates as a holistic exercise approach that addresses both physical and mental health aspects could increase participation rates among the elderly. Establishing community-based Pilates programs could also facilitate access and encourage social interaction, further contributing to the overall well-being of participants.

In conclusion, this study underscores the significant benefits of Pilates exercises in enhancing the quality of life among the elderly, offering evidence-based support for the inclusion of Pilates in health promotion and physical activity programs for aging populations. Despite its limitations, this research provides a foundation for future investigations and practice recommendations, emphasizing the role of Pilates in fostering an active, healthy, and fulfilling lifestyle in later years.

Authors' Contributions

A.S. designed the study, coordinated the Pilates exercise program, and led the data collection process. M.Y. conducted the statistical analysis, interpreted the data, and played a major role in writing the manuscript. Both authors reviewed and approved the final manuscript.

Declaration

In order to correct and improve the academic writing of our paper, we have used the language model ChatGPT.

Transparency Statement

Data are available for research purposes upon reasonable request to the corresponding author.

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Declaration of Interest

The authors report no conflict of interest.

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Ethics Considerations

The study protocol adhered to the principles outlined in the Helsinki Declaration, which provides guidelines for ethical research involving human participants.

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