

Article

Aerobic Exercise, Depression, Purpose in Life, and Quality of Life in Older Adults: Implications for Healthy Aging

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Abstract

Population aging has increased the importance of identifying modifiable lifestyle factors that promote psychological well-being and support brain health in later life. Aerobic exercise has consistently been associated with positive mental health outcomes; however, further evidence is needed regarding its relationship with depressive symptoms, purpose in life, and quality of life among community-dwelling older adults. The present study aimed to investigate the associations between aerobic exercise, depression, purpose in life, and quality of life in older adulthood, as well as their implications for healthy aging and brain health. A cross-sectional quantitative design was employed involving 151 older adults aged 65 years and older. Participants were recruited from Open Care Centers for the Elderly (KAPI) in the Municipality of Corinth, Greece, and through home visits in nearby communities. Data collection was conducted using the Purpose in Life Questionnaire–Short Form (PIL-SF), the Geriatric Depression Scale–Short Form (GDS-SF), and the WHOQOL-OLD Brief Form. Statistical analyses were performed using IBM SPSS Statistics, while non-parametric analyses were applied due to deviations from normality. The findings demonstrated that a higher frequency of aerobic exercise was significantly associated with lower depressive symptomatology, higher levels of purpose in life, and better quality of life. Participants who exercised almost daily reported significantly fewer depressive symptoms compared with those who exercised rarely or not at all. Furthermore, depressive symptoms were negatively correlated with both purpose in life and quality of life, whereas purpose in life was positively associated with quality of life. Gender differences were also observed, suggesting that the relationship between exercise and depressive symptoms may vary between men and women. Overall, the findings suggest that regular aerobic exercise may represent an important protective lifestyle factor associated with emotional well-being, psychological resilience, quality of life, and healthy aging among older adults. The study further supports the role of physical activity as a potentially beneficial non-pharmacological strategy for promoting mental health and supporting brain health in later life.

Keywords: aerobic exercise; older adults; depression; brain health; psychological well-being; quality of life; purpose in life; healthy aging; physical activity



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1. Introduction

Population aging has emerged as one of the most significant global demographic shifts, placing increasing emphasis on the physical and psychological well-being of older adults.

Although life expectancy has increased due to advances in healthcare and living conditions, later life is often accompanied by challenges such as chronic illness, emotional distress, functional limitations, and reduced quality of life. Consequently, identifying accessible and sustainable strategies that promote healthy and active aging has become a major priority for public health and gerontological research (World Health Organization, 2018; Rowe & Kahn, 1997).

Aerobic exercise is widely recognized as one of the most beneficial lifestyle behaviors for older adults. Previous research has shown that regular physical activity contributes to improved cardiorespiratory fitness (Pescatello et al., 2014), reduced cardiovascular and metabolic risk (Cornelissen & Smart, 2013; Colberg et al., 2016), lower levels of depression and anxiety (Bridle et al., 2012; Herring et al., 2010; Dinas et al., 2011; Pascoe et al., 2020; Heissel et al., 2023), and better physical functioning and independence (Paterson & Warburton, 2010; Chodzko-Zajko et al., 2009). In addition to its physical health benefits, regular physical activity has consistently been associated with enhanced psychological well-being and overall quality of life among older adults (Daskalopoulou et al., 2017; Netz, 2022; Netz et al., 2005).

Recent research has also highlighted the relationship between physical activity and purpose in life, a psychosocial construct that is particularly relevant during older adulthood. Older adults who engage in regular physical activity tend to report a stronger sense of meaning, direction, and personal fulfillment (Hooker & Masters, 2016; Kim et al., 2021; Ryff, 2018; Hill & Turiano, 2014). A stronger sense of purpose has, in turn, been associated with lower levels of depression and a higher quality of life. Importantly, this relationship may be bidirectional, as individuals with greater purpose in life may also be more likely to maintain active and healthy lifestyles.

Psychological well-being in later life is influenced by multiple interconnected factors. Anxiety and depressive symptoms have consistently been associated with poorer quality of life, reduced social functioning, and lower perceived health among older adults (Beutel et al., 2021; Brett et al., 2012; Konstantopoulou et al., 2025; J. M. Lee et al., 2022). Consequently, examining how lifestyle factors, such as physical activity, relate to depression, purpose in life, and quality of life may contribute to a better understanding of successful aging and psychological well-being.

International organizations, including the World Health Organization, emphasize the importance of maintaining regular physical activity throughout later life to support physical health, functional ability, social participation, and overall well-being (World Health Organization, 2018). Moreover, regular physical activity has been associated with healthy aging, reduced sedentary behavior, and lower risk of major non-communicable diseases (J. M. Lee et al., 2012; Daskalopoulou et al., 2017; Netz, 2022).

The present study investigated the associations between aerobic exercise, depressive symptoms, purpose in life, and quality of life among adults aged 65 years and older. Using validated measures of depression, purpose in life, and quality of life, data from 151 community-dwelling older adults were analyzed to explore how exercise participation relates to important indicators of psychological well-being in later life.

Based on previous research, it was hypothesized that exercise frequency, duration, and type may be associated with differences in depressive symptoms, purpose in life, and quality of life among older adults. By examining these relationships, the study aims to contribute to the growing literature on physical activity and psychological well-being and to provide evidence that may inform public health initiatives promoting active and healthy aging.

2. Materials and Methods

2.1. Study Design and Participants

A quantitative cross-sectional study was conducted to examine the associations between aerobic exercise, depressive symptoms, purpose in life, and quality of life among older adults. The study sample consisted of 151 adults aged 65 years and older residing in the Municipality of Corinth, Greece. Participants were recruited from Open Care Centers for the Elderly (KAPI) in Corinth and nearby communities, as well as through home visits to older adults who were unable to attend these centers.

Purposive sampling was employed based on the inclusion criterion of being aged 65 years or older. Participation was voluntary and anonymous. Data collection was conducted between December 2024 and April 2025. The study was designed to investigate the associations between physical activity and important indicators of psychological well-being in later life, including depressive symptoms, quality of life, and purpose in life. It should be noted that participants were recruited from community-based settings and may represent a relatively active and socially engaged subgroup of older adults. Therefore, caution is warranted when generalizing the findings to the broader older adult population, particularly individuals with greater health limitations or those living in institutional settings. Based on the previous literature, physical activity has been associated with improved mental health and quality of life among older adults. Furthermore, some studies suggest that exercise characteristics, including frequency, duration, and type of activity, may influence psychological outcomes, although findings remain inconsistent. Accordingly, the following research hypotheses were formulated:

1. Depression levels in older adults differ according to the frequency of aerobic exercise participation.
2. Depression levels in older adults differ according to the duration of physical exercise.
3. Depression levels in older adults differ according to the type of physical exercise performed.
4. Older adults who engage in aerobic exercise more frequently report higher scores on the Purpose in Life Questionnaire–Short Form compared with those who exercise less frequently or not at all.
5. Older adults who engage in aerobic exercise more frequently report higher scores on the WHOQOL-OLD compared with those who exercise less frequently or not at all.
6. Depression levels in older adults differ according to their self-rated physical condition.
7. There is a statistically significant association between depression, quality of life, and purpose in life among older adults.

By examining these relationships, the present study aims to contribute to a better understanding of the association between physical activity and psychological well-being in later life. The findings may inform future health-promotion initiatives and community-based interventions designed to support active and healthy aging among older adults.

2.2. Measures

Data were collected using a structured questionnaire consisting of demographic characteristics, exercise-related variables, and three standardized psychometric instruments. Purpose in life was assessed using the Purpose in Life Questionnaire–Short Form (PIL-SF), which consists of 12 items rated on a five-point Likert scale. Higher scores indicate a stronger perceived sense of meaning and purpose in life. Depressive symptoms were assessed using the Geriatric Depression Scale–Short Form (GDS-SF), a widely used screening instrument for depressive symptomatology in older populations. Higher scores indicate greater depressive symptom severity. Quality of life was assessed using the WHOQOL-OLD Brief Form, which evaluates perceived quality of life specifically in older adulthood.

In the present study, the total score was used, with higher scores reflecting better perceived quality of life. Exercise-related variables included self-rated physical condition, frequency of physical exercise, preferred type of exercise, and typical duration of exercise sessions. Physical exercise included both structured exercise programs and walking as forms of regular physical activity. Information regarding exercise intensity, weekly exercise volume, and long-term exercise history was not collected and should be considered when interpreting the findings.

2.3. Procedure and Ethical Considerations

Questionnaires were administered either at the Open Care Centers for the Elderly or during home visits. In several cases, the researcher assisted participants by reading the questionnaire items aloud without providing additional explanations or guidance that could influence participants' responses. Average completion time ranged from approximately 20 to 30 min. All participants were informed about the purpose and procedures of the study before participation and provided oral informed consent. Confidentiality, anonymity, voluntary participation, and the exclusive use of data for research purposes were ensured throughout the study process, in accordance with ethical research principles and the General Data Protection Regulation (GDPR). The study was conducted in accordance with the ethical principles outlined in the Declaration of Helsinki.

2.4. Statistical Analysis

Data were analyzed using IBM SPSS Statistics (Version 29.0; IBM Corp., Armonk, NY, USA). Descriptive statistics were calculated for all demographic and study variables, including means, standard deviations, frequencies, and percentages. Prior to inferential analyses, data normality was assessed using the Kolmogorov–Smirnov and Shapiro–Wilk tests. Since several variables significantly deviated from normality assumptions, non-parametric statistical procedures were applied.

Spearman's rank-order correlation coefficient was used to examine the relationships among depressive symptoms, purpose in life, and quality of life. Kruskal–Wallis H tests were conducted to compare depressive symptoms, purpose in life, and quality of life across exercise-related categories, including exercise frequency, type of exercise, duration of exercise, and self-rated physical condition. When statistically significant group differences were identified, Bonferroni-adjusted post hoc comparisons were performed to control for Type I error. Additionally, moderation analysis was conducted to examine whether gender moderated the relationship between exercise frequency and depressive symptoms. Statistical significance was set at $p < 0.05$ for all analyses.

3. Results

The final sample consisted of 151 older adults. Most participants were women ($n = 102$, 67.5%), while 49 participants were men (32.5%). The majority of participants were aged between 65 and 80 years ($n = 127$, 84.1%), whereas 24 participants (15.9%) were older than 80 years. Most participants were married (64.9%) and reported having children (96.7%) and grandchildren (86.1%). Regarding health-related characteristics, 5.3% of participants reported a diagnosis of dementia or Alzheimer's disease, 12.6% reported a history of depressive disorder, and 15.9% reported a history of anxiety disorder.

In terms of exercise frequency, 39 participants (25.8%) reported exercising almost daily, 44 participants (29.1%) exercised occasionally, 32 participants (21.2%) exercised rarely, and 36 participants (23.8%) reported no exercise participation. Among physically active participants, walking was identified as the most common form of physical activity (73.6%). Depressive symptoms differed significantly according to self-rated physical

condition, $\chi^2(3, N = 150) = 28.52, p < 0.001$. Participants who perceived their physical condition as very good reported significantly lower depressive symptom scores compared with those who evaluated their physical condition as moderate or poor. In contrast, participants reporting poor physical condition demonstrated the highest levels of depressive symptomatology. Depressive symptoms also differed significantly according to exercise frequency, $\chi^2(3, N = 151) = 16.82, p = 0.001$. Participants who exercised almost daily reported significantly lower depressive symptoms compared with those who exercised rarely or not at all. No statistically significant differences were identified among the remaining exercise-frequency groups.

No statistically significant differences in depressive symptoms were observed according to the preferred type of exercise, $\chi^2(5, N = 121) = 8.42, p = 0.134$. Similarly, exercise duration was not significantly associated with depressive symptoms, $\chi^2(2, N = 121) = 0.30, p = 0.862$ (Table 1).

Table 1. Descriptive statistics by exercise frequency (Mean $\pm$ SD, N).

Exercise Frequency	GDS Mean	GDS SD	PIL Mean	PIL SD	WHOQOL Mean	WHOQOL SD
None	6.42	3.01	29.53	6.25	82.12	11.35
Rarely	5.18	2.95	31.22	5.89	85.61	10.45
1–2 times/week	4.71	2.77	33.89	6.42	87.04	9.36
Almost daily	3.33	2.10	35.11	5.78	89.53	8.87

Quality of life differed significantly according to exercise frequency, $\chi^2(3, N = 150) = 22.08, p < 0.001$. Participants who exercised occasionally or almost daily reported significantly higher quality-of-life scores compared with those who exercised rarely or not at all. Likewise, purpose in life differed significantly according to exercise frequency, $\chi^2(3, N = 151) = 18.72, p < 0.001$. Participants who exercised occasionally or almost daily demonstrated significantly higher purpose-in-life scores compared with participants who did not engage in physical exercise (Table 2).

Table 2. Kruskal–Wallis test results according to exercise frequency.

Variable	χ^2	df	p	ϵ^2 (Effect Size)	Interpretation
GDS_total	16.82	3	0.001	0.09	Moderate
PIL_Score	18.72	3	<0.001	0.11	Moderate
WHOQOL_Score	22.08	3	<0.001	0.13	Moderate to Large

Spearman correlation analyses revealed statistically significant associations among depressive symptoms, purpose in life, and quality of life. Specifically, depressive symptoms were negatively associated with purpose in life ($\rho = -0.515, p < 0.001$) and quality of life ($\rho = -0.496, p < 0.001$). Furthermore, purpose in life demonstrated a positive association with quality of life ($\rho = 0.443, p < 0.001$). These findings indicate that lower depressive symptomatology was associated with stronger existential meaning and better perceived quality of life among older adults (Table 3).

Table 3. Spearman correlations among main variables.

Variables	ρ	p	Interpretation
GDS_total—PIL_Score	−0.515	<0.001	Large negative
GDS_total—WHOQOL_Score	−0.496	<0.001	Moderate negative
PIL_Score—WHOQOL_Score	0.443	<0.001	Moderate positive

Finally, moderation analyses demonstrated that the interaction between gender and exercise frequency was statistically significant ($p = 0.028$). Among men, all exercise-frequency categories were associated with significantly lower depressive symptoms compared with no exercise participation. In contrast, among women, only almost-daily exercise was significantly associated with lower depressive symptoms compared with no exercise participation. These findings suggest that the protective relationship between exercise participation and depressive symptomatology may be stronger among men. However, this finding should be interpreted cautiously due to subgroup size differences and the exploratory nature of the moderation analysis.

Significant differences according to exercise frequency were observed for depressive symptoms, purpose in life, and quality of life. Effect size estimates indicated moderate associations between exercise frequency and all three outcome variables (ϵ^2 ranging from 0.09 to 0.13), suggesting that exercise frequency accounted for a meaningful proportion of the observed variability in psychological well-being.

4. Discussion

The present study examined the associations between physical exercise, depressive symptoms, quality of life, and perceived purpose in life among older adults. Overall, the findings suggest significant associations between physical activity and key indicators of psychological well-being in later life. Specifically, lower depressive symptoms, higher quality of life, and stronger perceived purpose in life were associated with more frequent engagement in physical exercise, supporting previous evidence regarding the multidimensional benefits of physical activity among older adults (Daskalopoulou et al., 2017; Netz, 2022).

One of the main findings of the study was that older adults who perceived their physical condition as good or very good reported significantly lower levels of depressive symptoms compared with those who evaluated their physical condition as moderate or poor. This finding is consistent with previous studies demonstrating that both objective and subjective perceptions of physical health are closely associated with mental health outcomes in older populations (Dinas et al., 2011; Mikkelsen et al., 2021). Self-perceived physical fitness may not only reflect actual physical capability but also feelings of autonomy, self-efficacy, and functional independence, all of which are strongly related to emotional well-being. Although the present study did not directly assess biological mechanisms, previous research suggests that regular physical activity may be associated with improved psychological well-being through a combination of physical, behavioral, and social pathways. Conversely, poor self-rated physical condition may contribute to social withdrawal, reduced mobility, and feelings of dependency, thereby increasing vulnerability to depressive symptoms.

The results further demonstrated that exercise frequency was significantly associated with depressive symptoms among older adults. Participants engaging in exercise almost daily reported the lowest depression scores, whereas those exercising rarely or not at all reported the highest levels of depressive symptoms. These findings are consistent with previous research showing that regular physical activity is associated with lower levels of depression in older populations (Dinas et al., 2011; J. M. Lee et al., 2022; Pascoe et al., 2020). Several psychosocial mechanisms may help explain this association, including increased social engagement, greater self-efficacy, structured daily routines, and improved perceptions of physical health. Interestingly, occasional exercise did not appear sufficient to produce substantial differences in depressive symptoms compared with sedentary individuals, suggesting a possible relationship between exercise frequency and psychological well-being (Netz, 2022).

An alternative explanation should also be considered. Older adults experiencing fewer depressive symptoms, greater purpose in life, and higher quality of life may be more likely to engage in regular physical activity. Consequently, the direction of the observed associations cannot be determined from the present cross-sectional design. It is possible that physical activity contributes to psychological well-being, that psychologically healthier individuals are more likely to remain active, or that both processes operate simultaneously. Longitudinal and intervention studies are needed to clarify these relationships. This interpretation is consistent with previous evidence suggesting bidirectional associations between physical activity and depression (Choi et al., 2019).

In contrast, exercise type and exercise duration were not significantly associated with depressive symptoms. Older adults participating in different forms of exercise, including walking, dancing, running, or gymnastics, reported similar levels of depressive symptomatology. Likewise, no significant differences emerged according to exercise duration. These findings suggest that consistency and regular participation in physical activity may be more important for mental health than the specific type or duration of exercise performed. Previous studies similarly indicate that maintaining an active lifestyle may be more strongly associated with psychological well-being than the characteristics of individual exercise sessions (Mikkelsen et al., 2021; Chin et al., 2022; Pascoe et al., 2020). The absence of significant differences according to exercise type may also be partly explained by the relatively small number of participants within certain exercise categories.

Another important finding concerns the positive association between exercise frequency and quality of life. Older adults engaging in regular physical activity reported significantly higher quality of life compared with those with limited or no exercise participation. These results are consistent with the broader literature suggesting that physical activity is associated with improved physical functioning and psychosocial adjustment in aging populations (Daskalopoulou et al., 2017; Chodzko-Zajko et al., 2009). Physical activity may contribute to mobility, independence, social engagement, and overall well-being, all of which are important dimensions of quality of life in later life. Notably, even moderate participation in exercise appeared to be associated with better perceived quality of life, indicating that accessible and manageable forms of activity may still provide meaningful benefits. These findings are also consistent with the concept of successful aging proposed by Rowe and Kahn (1997).

The study also revealed that perceived purpose in life differed significantly according to exercise frequency. Participants who exercised occasionally or almost daily reported stronger feelings of purpose and meaning in life than those who exercised rarely or never. This finding supports theoretical perspectives suggesting that physical activity may contribute to existential well-being and personal fulfillment (Ryff, 2018). Exercise may reinforce a sense of competence, routine, autonomy, and social belonging, thereby strengthening purpose in life among older adults. Interestingly, no significant differences were found between occasional and daily exercisers, suggesting that even moderate levels of activity may be associated with greater psychological meaning and engagement with life.

Correlational analyses further demonstrated significant associations among depression, quality of life, and perceived purpose in life. Depressive symptoms were negatively associated with both quality of life and purpose in life, whereas purpose in life was positively associated with quality of life. These findings are consistent with previous research suggesting that depressive symptoms are associated with poorer psychological functioning, reduced life satisfaction, and lower quality of life among older adults (Chin et al., 2022; Mikkelsen et al., 2021). At the same time, maintaining a strong sense of purpose may serve as an important psychological resource that supports resilience and well-being

during aging (Ryff, 2018). The moderate strength of these correlations further highlights the multidimensional nature of psychological well-being in later life.

Finally, the findings suggest that the relationship between exercise frequency and depressive symptoms may vary according to gender. Men and women appeared to experience somewhat different psychological outcomes from physical activity, highlighting the possible influence of sociocultural and gender-related factors. Women may encounter more barriers to exercise participation, including caregiving responsibilities or reduced access to recreational opportunities, potentially requiring greater consistency in physical activity to experience comparable psychological benefits. However, these findings should be interpreted cautiously, given the unequal distribution of men and women in the sample and the exploratory nature of the moderation analysis.

Several limitations should be acknowledged. First, the cross-sectional design precludes conclusions regarding causality. Second, participants were recruited primarily from community-based settings and may represent a relatively healthy and socially active subgroup of older adults, limiting the generalizability of the findings to the broader older adult population. Third, women were overrepresented in the sample, which may have influenced gender-specific analyses. Finally, physical activity was assessed primarily in terms of exercise frequency, type, and duration, whereas exercise intensity, weekly volume, and long-term exercise history were not evaluated.

Overall, the present study highlights significant associations between regular physical activity, lower depressive symptoms, higher quality of life, and stronger purpose in life among older adults. These findings suggest that participation in regular exercise may represent an important component of healthy aging and psychological well-being. However, given the cross-sectional design, causal conclusions cannot be drawn. Future longitudinal studies should further examine the directionality of these associations and explore additional psychosocial, behavioral, and health-related factors that may influence well-being in later life.

5. Conclusions

The present study identified significant associations between physical exercise, depressive symptoms, quality of life, and perceived purpose in life among older adults. More frequent participation in physical activity was associated with lower levels of depressive symptoms, higher quality of life, and a stronger sense of purpose in life. In contrast, exercise type and duration were not significantly associated with depressive symptoms, suggesting that regular engagement in physical activity may be more closely related to psychological well-being than specific exercise characteristics.

Furthermore, quality of life and purpose in life were positively associated with physical activity, whereas depressive symptoms were negatively associated with both constructs. These findings highlight the complex interrelationships among psychological well-being, active lifestyle engagement, and perceived meaning in life during older adulthood.

Gender differences observed in the study suggest that the relationship between exercise frequency and depressive symptoms may vary between men and women. However, these findings should be interpreted cautiously due to the unequal gender distribution within the sample and the exploratory nature of the analysis. Future research should further investigate potential gender-specific patterns in the relationship between physical activity and psychological well-being.

Overall, the findings suggest that regular physical activity may represent an important component of healthy aging and psychological well-being among older adults. Nevertheless, given the cross-sectional design of the study, causal conclusions cannot be drawn. Future longitudinal and intervention studies are needed to clarify the direction of these

associations and to further explore the role of physical activity in supporting well-being during later life.

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