Research Square

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Associations of Frailty and Depressive Symptoms with Quality of Life Among Community-Dwelling Older Adults with Musculoskeletal Disorders

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Research Article

Keywords: older adults, musculoskeletal disorders, frailty, depressive symptoms, quality of life, community-dwelling older adults

Posted Date: November 6th, 2026

DOI: https://doi.org/10.21203/rs.3.rs-11292781/v1

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Additional Declarations: No competing interests reported.

Abstract

Background

Quality of life in older adults with musculoskeletal disorders may be influenced by frailty and depressive symptoms. Their joint contribution to quality of life in this population remains insufficiently examined.

Methods

A descriptive, cross-sectional study was conducted among 120 community-dwelling older adults with musculoskeletal disorders in Greece. Participants were recruited from two hospitals between December 2025 and April 2026 using purposive sampling. Quality of life, depressive symptoms, and frailty were assessed using the Older People's Quality of Life Questionnaire (OPQOL-35), Geriatric Depression Scale (GDS-15), and Tilburg Frailty Indicator (TFI), respectively. Pearson correlations and multiple linear regression were performed.

Results

Mean scores were 3.65 (*SD* = 4.00) for the GDS-15, 4.43 (*SD* = 3.33) for the TFI, and 121.73 (*SD* = 13.53) for the OPQOL-35. Depressive symptoms were positively correlated with frailty ($r = 0.777$, $p < 0.001$) and negatively correlated with quality of life ($r = -0.754$, $p < 0.001$). Frailty was also negatively correlated with quality of life ($r = -0.681$, $p < 0.001$). The regression model was significant ($F(2,117) = 84.670$, $p < 0.001$) and explained 59.1% of the variance in OPQOL-35 scores. Both depressive symptoms ($\beta = -0.567$, $p < 0.001$) and frailty ($\beta = -0.241$, $p = 0.011$) were independently associated with quality-of-life scores.

Conclusions

Depressive symptoms and frailty were independently associated with quality-of-life scores among community-dwelling older adults with musculoskeletal disorders. Concurrent assessment of psychological and frailty-related factors may provide a more comprehensive understanding of quality of life in this population.

Introduction

The physical and mental health of older adults in Greece has been the subject of increasing research attention in recent years [1]. Musculoskeletal disorders encompass a broad range of conditions affecting the locomotor system, including the muscles, bones, joints, and associated connective tissues. They include more than 150 conditions, ranging from osteoarthritis, rheumatoid arthritis, and osteoporosis to low back and neck pain, fractures, and sarcopenia. Musculoskeletal disorders are highly prevalent worldwide and represent a major contributor to disability, functional limitation, and reduced participation

in daily and social activities. According to the World Health Organization, approximately 1.71 billion people live with musculoskeletal conditions globally, with their burden increasing in association with population ageing and demographic growth [2]. Their consequences extend beyond physical symptoms, as pain, impaired mobility, and functional limitations may affect independence, social participation, and overall well-being.

Older adults are particularly vulnerable to the consequences of musculoskeletal disorders because ageing is accompanied by progressive changes in muscle mass and strength, bone structure, and joint function. Age-related changes in the musculoskeletal system may increase susceptibility to conditions such as osteoarthritis, osteoporosis, sarcopenia, and fractures, while coexisting chronic conditions may further contribute to functional limitations and reduced autonomy. Recent evidence indicates that musculoskeletal conditions in older adults are closely related to functional impairment and disability, with important implications for health and well-being [3, 4]. These interrelated processes are particularly relevant in later life, when the accumulation of health conditions and functional deficits may influence broader aspects of health and well-being.

Quality of life is a multidimensional outcome that encompasses physical, psychological, social, and other aspects of an individual's perceived well-being. In older age, quality of life may be affected by chronic disease burden, functional limitations, loss of independence, and changes in social participation. For older adults living with musculoskeletal disorders, persistent pain and impaired mobility may further restrict everyday activities and participation, potentially contributing to poorer perceived quality of life. Recent reviews of older adults with chronic musculoskeletal conditions have highlighted the relevance of pain, physical function, and quality of life as closely related dimensions of health in this population [5, 6]. The World Health Organization also identifies musculoskeletal conditions as a major contributor to disability and limitations in mobility and participation worldwide [2].

Frailty is another important multidimensional characteristic of ageing that is closely related to functional vulnerability and adverse health outcomes. Rather than representing an inevitable consequence of chronological ageing, frailty reflects an increased vulnerability arising from the accumulation of deficits across physical, psychological, and social domains. This multidimensional perspective is particularly relevant in older adults with musculoskeletal disorders, in whom physical limitations may coexist with psychological and social vulnerabilities. Previous evidence among community-dwelling older adults has consistently demonstrated an inverse association between frailty and quality of life, with frail and prefrail individuals reporting poorer quality-of-life outcomes than those who are non-frail [7, 8]. Moreover, studies based on multidimensional models of frailty have shown that physical, psychological, and social components are relevant to quality-of-life outcomes [9, 10].

Psychological well-being represents an additional dimension of relevance to quality of life in later life. Depressive symptoms are common among older adults and are associated with functional limitations, reduced social participation, and poorer quality of life. Evidence from population-based research indicates that higher depressive symptom scores are associated with reduced quality of life in older

adults [11]. In the context of musculoskeletal disorders, persistent pain, reduced mobility, and limitations in everyday activities may coexist with psychological distress, making the assessment of depressive symptoms particularly relevant. At the same time, depressive symptoms and frailty are closely related constructs in older age. A systematic review and meta-analysis found substantial associations between depression and frailty, supporting the relevance of considering the two conditions together rather than examining either construct in isolation [12].

Although the relationships of frailty and depressive symptoms with quality of life have been examined extensively in older populations, evidence specifically addressing their joint contribution to quality of life among community-dwelling older adults with musculoskeletal disorders remains limited, particularly in the Greek context. This population may present a combination of physical limitations, chronic disease burden, psychological vulnerability, and social factors that are relevant to perceived quality of life. Examining frailty and depressive symptoms concurrently may therefore provide a more integrated understanding of factors associated with quality of life in older adults with musculoskeletal disorders. Such an approach is also consistent with the multidimensional nature of both frailty and quality of life and with the observed interrelationship between frailty and depressive symptoms in later life.

The present study therefore aimed to examine the associations of frailty and depressive symptoms with quality of life among community-dwelling older adults with musculoskeletal disorders in Greece. Specifically, the study examined the relationships among frailty, depressive symptoms, and quality of life assessed the extent to which frailty and depressive symptoms were independently associated with quality-of-life scores in a multivariable model.

Methods

Study design and participants

A quantitative, descriptive, cross-sectional study with a correlational design was conducted to investigate quality of life, frailty, and depressive symptoms among community-dwelling older adults with musculoskeletal disorders.

Participants were community-dwelling older adults recruited during outpatient visits at the University General Hospital of Patras “Panagia i Voitheia” and the General Hospital of Patras “Agios Andreas” between December 2025 and April 2026. None of the participants were hospitalized at the time of data collection. Eligibility criteria included age ≥ 65 years, a musculoskeletal disorder, living in the community, and sufficient ability to communicate and understand the Greek language. Individuals with a diagnosis of severe cognitive impairment or dementia, as well as those with an acute psychiatric or physical condition that prevented participation, were excluded.

A purposive sampling approach was used. A total of 120 older adults who met the eligibility criteria participated in the study. A retrospective sample size adequacy check indicated that a minimum of 100 participants would be required to detect a small-to-medium effect size ($f^2 = 0.10$) with 80% power at $\alpha =$

0.05 for a multiple linear regression model with two predictors. The final sample of 120 participants exceeded this threshold.

Measures

Data were collected using a structured questionnaire comprising sociodemographic and health-related questions and three standardized assessment instruments.

Sociodemographic and health-related characteristics included age, sex, place of residence, educational level, marital status, financial status, presence of chronic conditions, medication use, and self-rated health.

Older People's Quality of Life Questionnaire (OPQOL-35)

Quality of life was assessed using the 35-item Older People's Quality of Life Questionnaire (OPQOL-35). The instrument assesses multiple domains of quality of life, including life overall, health, social relationships and participation, independence, control over life and freedom, home and neighborhood, psychological and emotional well-being, financial circumstances, and religion and culture. Items are scored on a Likert-type scale, with reverse coding applied where appropriate, such that higher total scores indicate better quality of life. The total score ranges from 35 to 175.

The OPQOL-35 has demonstrated acceptable psychometric properties in older populations [13, 14, 15].

Geriatric Depression Scale (GDS-15)

Depressive symptoms were assessed using the 15-item short form of the Geriatric Depression Scale (GDS-15). The GDS-15 is a self-report screening instrument specifically developed for the assessment of depressive symptoms in older adults. Items are answered using a dichotomous “yes/no” response format. Ten items indicate depressive symptoms when answered affirmatively, whereas five items are reverse scored. Higher total scores indicate greater levels of depressive symptoms.

The short form was developed from the original 30-item Geriatric Depression Scale and has been widely used in both clinical and community settings because of its brief administration time [16, 17, 18].

Tilburg Frailty Indicator (TFI)

Frailty was assessed using the Tilburg Frailty Indicator (TFI), a self-report instrument developed to assess multidimensional frailty among community-dwelling older adults. The TFI evaluates three domains of frailty: physical, psychological, and social frailty.

The physical domain includes items related to weight loss, difficulties with walking and balance, hearing and vision problems, reduced hand strength, and physical fatigue. The psychological domain assesses memory problems, depressive feelings, anxiety or nervousness, and difficulties in coping with problems. The social domain assesses loneliness, lack of social relationships, and lack of social support.

The total TFI score ranges from 0 to 15, with higher scores indicating greater frailty. A total score ≥ 5 is commonly used to indicate frailty [19, 20, 21, 22].

Data collection and procedure

Participation was voluntary and anonymous. Before completing the questionnaire, participants were informed about the purpose and objectives of the study, the voluntary nature of participation, the confidentiality of the collected information, and their right to decline participation or withdraw without consequences. Written informed consent was obtained from all participants prior to data collection.

All collected data were treated confidentially and were used exclusively for research purposes. Individual-level information that could permit participant identification was not reported; results were presented in aggregate form.

Statistical analysis

Statistical analyses were performed using IBM SPSS Statistics. Descriptive statistics were used to summarize the characteristics of the sample and the study variables. Categorical variables were presented as frequencies and percentages, whereas continuous variables were summarized using means and standard deviations.

Pearson correlation coefficients were calculated to examine the associations among frailty, depressive symptoms, and quality of life. Multiple linear regression analysis was performed to examine the extent to which frailty and depressive symptoms were associated with quality of life. The OPQOL-35 total score was treated as the dependent variable, while frailty and depressive symptoms were entered as predictor variables. Internal consistency of the study instruments was assessed using Cronbach's alpha coefficient. The observed coefficients were 0.900 for the GDS-15, 0.815 for the TFI, and 0.882 for the OPQOL-35.

No missing data were observed, as questionnaires were completed with the assistance of a researcher who ensured that all items were answered.

Results

Participant characteristics

A total of 120 older adults were included in the study, with an equal distribution of men and women. The mean age was 72.05 years (SD = 6.61). Most participants were married (75.8%) and lived with a spouse or family member (80.8%). Regarding socioeconomic characteristics, 62.5% reported moderate financial status, while 30.8% reported good and 6.7% difficult financial circumstances. Most participants had one or two chronic conditions (67.5%), and 79.2% reported regular medication use. Self-rated health was

reported as good or very good by 54.2% of participants, while 39.2% rated their health as moderate (Table 1).

Table 1
Sociodemographic and health characteristics of the study participants

Characteristic	***n* (%)**
Age, years, mean (SD)	72.05 (6.61)
Sex	
Male	60 (50.0)
Female	60 (50.0)
Marital status	
Married	91 (75.8)
Not married*	29 (24.2)
Education	
Primary or lower	47 (39.2)
Secondary	44 (36.7)
Higher/tertiary	29 (24.2)
Living arrangement	
Alone	23 (19.2)
With spouse/family	97 (80.8)
Financial status	
Good	37 (30.8)
Moderate	75 (62.5)
Difficult	8 (6.7)
Number of chronic conditions	
0	18 (15.0)
1–2	81 (67.5)
3–5	21 (17.5)
Specific chronic conditions	
Hypertension	44 (36.7)
Diabetes	22 (18.3)

Notes. *N* = 120, *Not married includes single, widowed, and divorced participants. Participants could report more than one chronic condition; therefore, percentages do not sum to 100%.

Characteristic	*n* (%)
Heart disease	13 (10.8)
COPD/asthma	26 (21.7)
Arthritis	54 (45.0)
Kidney disease	3 (2.5)
Stroke	3 (2.5)
Malignancy	7 (5.8)
Other	19 (15.8)
Medication use	
Yes	95 (79.2)
No	25 (20.8)
Self-rated health	
Poor	8 (6.7)
Moderate	47 (39.2)
Good/very good	65 (54.2)
Notes. *N* = 120, *Not married includes single, widowed, and divorced participants. Participants could report more than one chronic condition; therefore, percentages do not sum to 100%.	

The mean GDS-15 score was 3.65 (*SD* = 4.00), while the mean TFI and OPQOL-35 scores were 4.43 (*SD* = 3.33) and 121.73 (*SD* = 13.53), respectively (Table 2).

Table 2
Descriptive statistics of the study variables

Measure	Mean	*SD*
GDS-15 total score	3.65	4.00
TFI total score	4.43	3.33
OPQOL-35 total score	121.73	13.53
Note. SD = standard deviation.		

Higher depressive symptom scores were associated with lower quality of life and greater frailty, while greater frailty was also associated with lower quality of life. Total GDS-15 scores showed a positive correlation with total TFI scores ($r = 0.777$, $p < 0.001$) and a negative correlation with total OPQOL-35 scores ($r = -0.754$, $p < 0.001$). Similarly, total TFI scores were negatively correlated with total OPQOL-35 scores ($r = -0.681$, $p < 0.001$) (Table 3).

Table 3
Correlations among depressive symptoms, frailty and overall quality of life

Variable	GDS-15 total	TFI total	OPQOL-35 total
GDS-15 total	1.000	0.777**	−0.754**
TFI total	0.777**	1.000	−0.681**
OPQOL-35 total	−0.754**	−0.681**	1.000
Notes. Pearson's correlation coefficients (*r*); *N* = 120, **$p < 0.001$.			

A multiple linear regression analysis was conducted to examine the factors associated with quality-of-life scores. The overall model was statistically significant, $F(2, 117) = 84.670$, $p < 0.001$, with an R^2 of 0.591 and an adjusted R^2 of 0.584, indicating that the model explained 59.1% of the variance in OPQOL-35 scores.

Both depressive symptoms and frailty were independently associated with quality-of-life scores. Depressive symptoms showed a negative standardized association with OPQOL-35 scores (β = −0.567, $B = -1.919$, $p < 0.001$), while total frailty was also a significantly associated with quality of life (β = −0.241, $B = -0.979$, $p = 0.011$). The 95% confidence intervals for both regression coefficients excluded zero. Collinearity diagnostics indicated no problematic multicollinearity (VIF = 2.519 for both predictors).

Table 4
Multiple linear regression analysis of predictors of quality-of-life scores

Variable	*B*	*SE*	β	*t*	*p*	95% CI for *B*	VIF
Constant	133.070	1.337	—	99.495	< 0.001	130.421 to 135.719	—
GDS-15	−1.919	0.318	−0.567	−6.042	< 0.001	−2.548 to − 1.290	2.519
TFI total	−0.979	0.381	−0.241	−2.570	0.011	−1.733 to − 0.225	2.519

Model statistics: $R^2 = 0.591$; adjusted $R^2 = 0.584$; $F(2, 117) = 84.670$, $p < 0.001$.

Note

B = unstandardized coefficient; β = standardized coefficient; SE = standard error; CI = confidence interval; VIF = variance inflation factor.

Discussion

The present study examined the associations of frailty and depressive symptoms with quality of life among community-dwelling older adults with musculoskeletal disorders and identified both depressive symptoms and frailty as significant, independent correlates of quality-of-life scores. Depressive symptoms showed a negative correlation with quality of life, while frailty also remained significantly

associated with quality of life after accounting for the contribution of depressive symptoms. These findings support the relevance of considering psychological well-being and multidimensional frailty together when examining quality of life in older adults.

The inverse association between frailty and quality of life observed in the present study is consistent with previous evidence from community-dwelling older populations. Systematic reviews have consistently reported poorer quality of life among older adults experiencing frailty, across both health-related and broader measures of quality of life [7, 8]. The present findings are also in agreement with research based on the multidimensional concept of frailty. Gobbens and van Assen [9] reported that physical, psychological, and social components of frailty contributed to the prediction of quality-of-life outcomes in community-dwelling older adults. Similarly, Zhang et al. [10] found that physical, psychological, and social frailty were associated with poorer health-related quality of life in older adults across several European countries. Comparable associations between frailty and quality of life have also been reported in the Greek context, including among older adults with Type 2 diabetes mellitus [23], further supporting the consistency of this relationship across different chronic disease populations in Greece. These findings support the relevance of assessing frailty as a multidimensional construct when quality of life is the outcome of interest.

Depressive symptoms were also closely associated with quality of life in the present study. This finding is consistent with previous research showing that higher depressive symptomatology is associated with poorer quality of life among older adults [11, 24]. In the Greek context specifically, protective psychosocial factors such as meaning in life and happiness have similarly been shown to buffer against depressive symptoms in community-dwelling older adults [25], underscoring the relevance of psychological well-being for this population. Importantly, depressive symptoms remained independently associated with total OPQOL-35 scores in the multivariable analysis and showed a larger standardized coefficient than frailty. This indicates that depressive symptoms showed a greater standardized association with quality-of-life scores within the present model. This result should be interpreted as a statistical association rather than a causal effect, given the cross-sectional design of the study.

The positive association observed between depressive symptoms and frailty is also consistent with the existing literature. Systematic reviews and meta-analyses have identified a close and potentially bidirectional relationship between depression and frailty in older adults [12]. The coexistence of these conditions may reflect overlapping physical, psychological, and social vulnerabilities, including reduced activity, functional limitations, fatigue, and reduced engagement with everyday activities. However, the cross-sectional nature of the present study does not allow the temporal direction of this relationship to be established. The findings therefore support the value of assessing depressive symptoms and frailty concurrently when evaluating quality of life in older adults.

The multivariable model further showed that depressive symptoms and frailty jointly explained 59.1% of the variance in OPQOL-35 scores. The larger standardized coefficient for depressive symptoms indicates a stronger independent association with quality-of-life scores when considered alongside frailty.

Nevertheless, frailty remained significantly associated with quality of life, indicating that quality of life cannot be considered solely from a psychological perspective. The simultaneous contribution of these two variables is consistent with the multidimensional nature of quality of life in later life and supports an integrated approach to its assessment.

Conclusions

Overall, the present findings indicate that both depressive symptoms and frailty were independently associated with quality-of-life scores among community-dwelling older adults with musculoskeletal disorders. These findings highlight the importance of considering psychological and multidimensional frailty-related factors together when evaluating quality of life in later life. Longitudinal research is needed to clarify the temporal relationships among these domains and to determine whether changes in frailty or depressive symptoms are accompanied by changes in quality of life.

Directions for Future Research

Future research should use longitudinal designs to clarify the temporal relationships among frailty, depressive symptoms, and quality of life in older adults with musculoskeletal disorders. Larger and more representative samples are also needed to improve the generalisability of findings and to examine whether changes in frailty and depressive symptoms are associated with subsequent changes in quality of life. Further studies could also investigate these relationships across different musculoskeletal conditions and healthcare settings.

Limitations

Several limitations should be considered when interpreting these findings. The cross-sectional design prevents conclusions regarding causality or temporal relationships among depressive symptoms, frailty, and quality of life. The use of purposive non-probability sampling limits the generalisability of the findings beyond the study population. In addition, all three principal constructs were assessed using self-report instruments, which may be subject to reporting bias. Nevertheless, the use of established instruments with satisfactory internal consistency in the present sample strengthens the measurement of the study variables.

A further limitation concerns the conceptual overlap between the TFI and GDS-15, as the psychological domain of the TFI includes an item on depressive feelings. This overlap may have contributed to the strong observed correlation between frailty and depressive symptoms and should be considered when interpreting their independent contributions in the regression model.

Ethical considerations

The study was conducted within the framework of the Postgraduate Programme 'Management of Ageing and Chronic Diseases' of the Hellenic Open University, in collaboration with the University of Thessaly, and was approved by the academic supervisor. Written informed consent was obtained from all participants prior to data collection, and the study adhered to the ethical principles of the Declaration of Helsinki regarding voluntary participation, confidentiality, and the right to withdraw.

All participants were informed about the purpose and procedures of the study, the voluntary nature of participation, the confidentiality and anonymity of the collected information, and their right to decline participation or withdraw from the study without any consequences. Written informed consent was obtained from all participants prior to data collection.

This study followed the STROBE (Strengthening the Reporting of Observational Studies in Epidemiology) guidelines for cross-sectional studies.

Declarations

Clinical trial number

Not applicable

Funding

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

Author Contribution

F.S. and G.T. contributed to the conception and design of the study. E.F. and I.P. contributed to data collection and interpretation of the results. M.S. and M.M. contributed to the statistical analysis and interpretation of the data. A.T. and T.P. contributed to study supervision and critical revision of the manuscript. G.T and T.P. drafted the manuscript. All authors reviewed and approved the final version of the manuscript.

Data Availability

The datasets generated and analyzed during the current study are not publicly available due to privacy restrictions but are available from the corresponding author on reasonable request.

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