

A Systematic Literature Review of the Relationships Between Social and Interpersonal Factors and Physical Activity Among Older Adults

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Abstract

Objective: This systematic literature review's purpose was to examine the social factors (e.g., social network, social support, social interaction, loneliness, and social environmental factors) associated with PA among older adults.

Data Source: Electronic databases (PsycINFO, MEDLINE, Scopus, and Web of Science) were used in this study.

Study Inclusion and Exclusion Criteria: Studies published in English focusing on individuals aged 65+ that assess social and intrapersonal factors influencing PA, with quantitative data on these relationships, were included, regardless of the PA measurement method.

Data Extraction: Two independent reviewers extracted data using a standardized form, capturing study design, sample size, participant characteristics, social factors assessed, and their relationship to PA behavior.

Data Synthesis: A descriptive summary of study characteristics and methodological quality was conducted.

Results: 1560 articles were identified and 34 were included. Wider social networks, social support, social cohesion, social norms towards PA, and positive social interactions were positively associated with PA among older adults, whereas obstructive factors (e.g., loneliness and social isolation) of the social environment were negatively associated with PA.

Conclusions: The findings indicate that the social environment plays a strong role in determining PA levels among older adults. Interventions targeting PA enhancement in this population should prioritize strengthening social support and networks related to PA. Future research should focus on elucidating the mechanisms through which social factors impact PA in older adults.

Keywords

physical activity, exercise, social factors, older adults

Key Point

Interventions aimed at promoting PA within the aging population should prioritize strategies such as enhancing social support and social network towards PA, so improving the obstructive factors are important considerations.

Introduction

Engaging in regular physical activity (PA) has a wide range of health advantages, such as decreasing the likelihood of chronic ailments, enhancing mental well-being, and elevating overall quality of life.¹ Several studies have demonstrated that increased PA and reduced sedentary behavior among older adults are associated with notable enhancements in their quality of life and substantial reductions in medical

expenditures.^{2,3} Unfortunately, a substantial proportion of individuals aged 65 years and older fail to engage in sufficient PA to attain these health benefits. According to the Centers for Disease Control and Prevention (CDC), 28% of older adults in the United States adhere to the recommended guidelines for

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PA, which entail at least 150 minutes of moderate-intensity aerobic activity or 75 minutes of vigorous-intensity aerobic activity per week, or a combination of both.⁴ This is concerning because physical inactivity has been linked to increased risk of chronic diseases such as cardiovascular disease, stroke, and type 2 diabetes.^{5,6}

Numerous scholars in the field of health behavior emphasize the need for an integrated observation of social components (eg, social network, social support, social environment, social connection, and social norms) to enhance their understanding of social connections and social structures in health behavior.^{7,8} Social and interpersonal factors have been found to be important predictors of PA.^{9,10} Social or interpersonal factors are those that are related to an individual's social environment, including their relationships with family, friends, and community members, as well as their social support networks and social norms.¹¹ These factors have been found to be particularly relevant to PA behavior among older adults, as social interactions and support, have been shown to be important motivators for PA participation.¹² In addition, one scholar reported that social connectivity and social support can increase exercise adherence in older adults,¹³ and in this way PA participation in their leisure time can strengthen social leisure and interconnection and provide value-added benefits in old age. Further, PA increases social activities like lunch clubs and community center visits where social interaction might have been a reason for the attendance of the older adults, and these social activities are related to their health and happiness.¹⁴ Since social activities strengthen the positive association between PA and well-being and affect older adults' behavior,¹⁵ their enhanced social activities are associated with a decrease in mortality compared to other leisure activities, and provide stress relief.¹⁶ Although the terms 'social' and 'interpersonal' are often used interchangeably in previous studies, in the scope of this study, the term social is used to encompass both social and interpersonal factors for consistency and clarity. The term includes social norms, interaction, network, support, and environmental factors that are consistent with how the social environment has been conceptualized in previous studies, as well as factors such as an individual's relationships with family, friends, and community members.^{11,17}

Previous systematic reviews/frameworks about this subject have either concentrated on specific social factors such as social support or social norms,^{18,19} or have encompassed a broader range of factors influencing PA behavior across all age groups.²⁰ Prochnow and Patterson²¹ reviewed 28 articles systematically to investigate the association between social network and PA behaviors in adults aged 18 to 64 years old, so they demonstrated that social connection is an important key way for adults' PA and PA behaviors were associated with social network's size, composition, and strength. Another study by Smith and colleagues reported a systematic literature review of the association between PA and social determinants in older adults, but it is difficult to explain whether the overall

social factors are related to PA because they also examined only specific factors (social support and loneliness).²² Theories and models, such as the social-ecological framework, serve as frameworks for examining the determinants of PA behavior, and the assessment of participants' social networks frequently involved not only social connection and social support but also measuring social cohesion and social norms for their PA engagement.²³ Therefore, this systematic literature review will comprehensively examine the social factors (eg, social network, social support, social interaction, loneliness, and social environmental factors) associated with PA among older adults. The findings from this review have the potential to contribute to the development of more effective interventions that address the distinct social obstacles faced by older adults. By enhancing their levels of PA, these interventions can lead to enhanced health outcomes and an improved quality of life for this population.

Methods

Data Sources

The present study used a systematic approach to identify relevant studies published in peer-reviewed journals. Based on electronic databases (PsycINFO, MEDLINE, Scopus, and Web of Science), previous articles were searched by using a combination of keywords related to PA, social factors, and older adults.

Inclusion and Exclusion Criteria. Studies were included if they met the following criteria: (1) published in English language peer-reviewed journals; (2) only included participants aged 65 years and older; (3) included participants who do not have specific diseases or conditions; (4) assessed social factors related to PA behavior; (5) measured PA either in self-report or device measured; and (6) reported quantitative data on the relationship between social factors and PA behavior. Data extraction was conducted using a standardized form, including study design, sample size, participant characteristics, social factors assessed, and the relationship between these factors and PA behavior.

Data Synthesis. Search terms for this search were as follows: ("physical activity" OR "exercise" OR "workout" OR "aerobic" OR "walking") AND ("social network analysis" OR "social network" OR "social support" OR "social norm" OR "friend*" OR "peer" OR "social influence" OR "social environment" OR "interpersonal" OR "social interaction" OR "social connect*" OR "social isolation" OR "loneliness" OR "psychosocial") AND ("older adult" OR "elder" OR "senior citizen" OR "retire" OR "geriatric"). Records were imported into Covidence for review management.²⁴ It is important to note that this review was not registered prior to conducting the search. While registration of systematic reviews promotes transparency, the absence of registration does not affect the

validity of our findings, as the review followed standardized systematic review procedures, including strict adherence to PRISMA guidelines, ensuring a transparent and replicable approach.

The studies were screened and selected based on predetermined inclusion and exclusion criteria by two independent reviewers. In this systematic review, we included both Randomized Controlled Trials (RCTs) and cross-sectional studies to assess the association between PA and social variables among older adults. Only baseline data from RCTs were included and treated similarly to cross-sectional studies to maintain consistency in exploring the associations between social factors and PA. The initial search revealed 1560 articles, but duplicate articles were removed prior to abstract review ($n = 532$). Subsequently, the inclusion criteria were applied to review the titles and abstracts, resulting in the exclusion of 813 articles. The remaining articles ($n = 215$) were reviewed independently by two authors. The reviewers demonstrated an agreement rate of 85% during the full-text review stage. Discrepancies between the two reviewers were resolved through discussion and consensus or by a third reviewer. A total of 181 articles were excluded during the full-text assessment stage for the following reasons: involved adults who were not over 65 years old ($n = 78$); did not conduct an analysis between PA and social variables ($n = 39$); did not measure PA ($n = 18$); or did not measure the social factors ($n = 24$). Additionally, articles were removed if they were commentaries or editorials ($n = 2$), reported only qualitative results ($n = 17$), or narrowly focused on special populations ($n = 3$). Consequently, the final sample consisted of 34 articles, which were then subjected to data extraction. For detailed information and a visual representation, Figure 1 shows the complete Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) data and diagram.

To enhance the evaluation of potential bias in each study, all articles we gathered were appraised using an adapted checklist (See Table 1) containing 15 criteria common to observational studies.^{25,26} Criteria had a yes (1 point); no (0 points); or unclear (0 points) answer format. All criteria had the same weight and a quality score ranging from 0 to 16 points was calculated for each study. The average article quality from appraisals was 14.17 points out of 16, $SD = 1.32$. Data elements and appraisals were checked by an additional researcher.

Results

Study Description

The articles included in this study presented a range of sample sizes, ranging from 37 to 50,986 participants (mean = 4195, $SD = 11,184$, and median = 386). Within this sample, approximately one-third of studies were conducted in the United States ($n = 10$, 29.4%).²⁷⁻³⁶ The remaining studies were conducted in Canada ($n = 4$, 11.8%),³⁷⁻⁴⁰ Japan ($n = 2$,

5.9%),^{41,42} the United Kingdom ($n = 2$, 5.9%),^{43,44} Korea ($n = 2$, 5.9%),^{45,46} Australia ($n = 2$, 5.9%),^{47,48} Belgium ($n = 2$, 5.9%),^{49,50} Sweden ($n = 2$, 5.9%),^{51,52} and Germany ($n = 2$, 5.9%).^{53,54} Furthermore, five other countries, namely Italy,⁵⁵ Spain,⁵⁶ the Netherlands,⁵⁷ Iran,⁵⁸ and Nigeria⁵⁹ were each represented by a single article. One article (2.9%) encompassed results from multiple countries, specifically Denmark, Spain, Germany, and the United Kingdom.⁶⁰ Further details regarding the sampled articles are reported in Table 1.

Study Design

Cross-sectional studies accounted for over half of the studies ($n = 22$, 64.7%),^{27,28,30,32-34,40-42,44-47,49,50,52,54,56-60} followed by longitudinal studies ($n = 7$, 20.6%).^{29,31,39,43,48,51,53} Randomized Controlled Trials (RCTs)^{36-38,55} and experimental studies³⁵ constituted 11.8% ($n = 4$) and 2.9% ($n = 1$) of the studies, respectively.

Physical Activity (PA) measures

In the majority of articles, PA was assessed through self-surveys or questionnaires ($n = 22$, 64.7%).^{28-31,33-36,39,41,43,45-49,51,53,56-59} Nine articles utilized accelerometers (eg, Actigraph, ActiPAL3, and Fitbit OneTM) that had been validated in prior studies (26.5%).^{27,37,38,40,42,44,52,54,60} Additionally, three articles used a combination of accelerometers and self-reported measures (8.8%).^{32,50,55}

Social factors measures

The types of social factors collected varied among the articles. 16 articles reported associations with PA using social support measures,^{27,30,32,34,37,39,42,43,45,46,49,51-53,58,59} many of which were questionnaires developed by Sallis and colleagues.⁶¹ Additionally, measures of social network ($n = 9$),^{31,33,35,37,38,42,43,51,52} social isolation ($n = 6$),^{36,44,47,48,54,60} and loneliness ($n = 6$, 17.14%)^{31,36,40,44,45,55} were utilized as indicators of social factors. Social interactions^{29,41,50,56,58} were measured in five articles. Other studies included measurements of social cohesion ($n = 2$)^{28,29} and social participation ($n = 2$).^{41,52} Two different measures (eg, social influence⁵⁷ and social norms²⁹) were each represented by one article (Table 2).

Main Findings

Table 3 reports the main findings and an aggregated look at associations between social environment factors and PA.

Social Network

Most investigated studies found that wider social networks are associated with higher PA levels. Chen and colleagues⁵² found

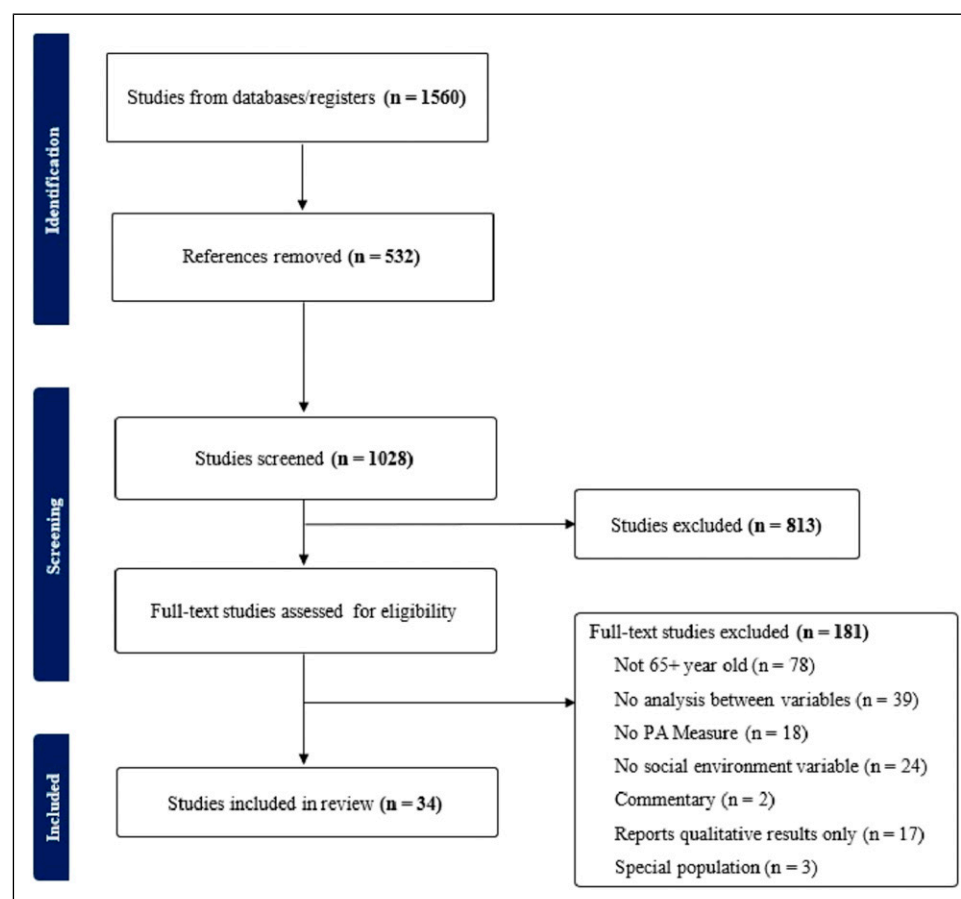


Figure 1. PRISMA flow diagram. PA indicates physical activity.

that high levels of social network and social participation were associated with low sedentary time and high PA. In addition, a study by Crandall found that socially connected participants were less likely to decrease PA than those who were not, indicating that high social connection was associated with PA levels and participation.³⁵ However, based on multiple regression analysis, Harada and colleagues⁴² found that social and environmental factors such as social network, self-efficacy, and self-regulation were not correlated with PA variables in older adults. One previous study found that those with wider social networks were more likely to achieve target moderate to vigorous physical activity (MVPA).⁴³ Lee and colleagues³³ indicated that psychosocial indicators such as self-efficacy, intrinsic motivation, spiritual engagement, perceived social relationships, and neighborhood safety were significantly associated with the PA of older adults aged 65 or older in the United States. McMahon's two studies both revealed that older adults who received an element of social networks, had increased average total PA hours per week^{37,38} and Sjöberg and colleagues⁵¹ revealed that poor social networks are associated with reduced high intensity PA. However, in Yang's study, social networks were used as control variables, but they did not present the specific values of the results.³¹

Social Support

Studies found that social support has a positive effect on PA.^{32,34,37,43,46,49,51-53,58,66,67,74,77} Social support includes support from participants' families, friends, and community members to participate in their enhanced PA. Kendrick and colleagues found that those who had higher levels of social support were more likely to achieve the target MVPA level,⁴³ and the other study also found that perceived social support had a significantly positive effect on PA and quality of life while decreasing loneliness.⁶⁶ Perrino and colleagues⁷⁷ showed that depressive symptoms were associated with lower likelihood and amount of walking among participants receiving high levels of instrumental social support. One study by McMahon found that participants who received interventions with social behavior change strategies provided significantly higher ratings of social support for PA from family post-intervention.³⁷ Van Cauwenberg and colleagues⁴⁹ found that frequency of contact with neighbors, neighbors' social support, neighborhood involvement, participation, and volunteering had a significant positive relationship with PA levels. However, Harada's study analyzed the correlation between social environmental factors including social support and PA variables in 262 older adults in Japan and found that

Table 1. Criteria for Quality Assessment and the Number (%) of Studies Scoring a Point for Each Separate Item.

Criterion	Description	n (%)
Objectives	Are the objectives or hypotheses of the research described in the paper stated?	35 (100)
Study design	Is the study design presented?	34 (97)
Target population	Do the authors describe the target population they wanted to research?	35 (100)
Sample	Was a random sample of the target population taken? AND was the response rate 60% or more?	16 (46)
Sample	Is participant selection described?	34 (97)
Sample	Is participant recruitment described, or referred to?	34 (97)
Sample	Are the inclusion and/or exclusion criteria stated?	28 (80)
Sample	Is the study sample described? (Minimum description = sample size, gender, age, and an indicator of SES)	31 (89)
Sample	Are the number of participants at each stage of the study reported? (Authors should report at least numbers eligible, numbers recruited, numbers with data at baseline, and numbers lost to follow-up)	34 (97)
Measurement	Are measures of physical activity described?	35 (100)
Measurement	Are measures of social environment described?	34 (97)
Measurement	Do authors describe the source of their data (eg, cancer registry, health survey) AND did authors describe how the data were collected? (eg, by mail)	35 (100)
Measurement	Was the reliability of the measures mentioned or referred to?	30 (86)
Measurement	Was the validity of the measures mentioned or referred to?	30 (86)
Statistical methods	Were appropriate statistical methods used and described, including those for addressing confounders?	35 (100)
Statistical methods	Were the numbers/percentages of participants with missing data for sitting and the health outcome indicated AND if more than 20% of data in the primary analyses were missing, were methods used to address missing data?	16 (46)

there was no significant correlation between social support and PA variables because the absolute values of Pearson's correlation coefficients indicated less than 0.20.

Social Interaction

The five articles analyzed in our study found a positive association between PA and social interaction.^{29,41,50,58,76} Specifically, Bakhtari and colleagues demonstrated that all social predictor factors were positively and significantly correlated with PA, suggesting their potential role in enhancing social interactions and preventing isolation and loneliness, thereby contributing to improved health outcomes.⁵⁸ Otaki and colleagues⁴¹ found that PA was positively associated with in-person contact indicators: interaction with friends and social participation. Additionally, sedentary time was negatively associated with the social contact variable of interaction with friends.

Social Influence

One article, classified as social influences, examined the effects of the social environment on health behavior in older adults in the Netherlands and found that perceived social influence was involved in the likelihood of PA in older adults. In particular, the study found that men were more sensitive to social influence on health behaviors than women.⁵⁷

Social Cohesion

We found conflicting results in two articles analyzing social cohesion.^{28,29} According to a study by Lee and colleagues, the relationship between social cohesion and walking was significant ($r = .073$, $P < .01$), suggesting that older adults who reported high social cohesion walked more than their neighbors. In addition, the study showed that social cohesion has a positive effect on walking frequency.²⁸ However, Mertens' study found that older adults who perceived higher neighborhood social trust and cohesion had 2.13 times lower odds (95% CI = 0.27, 0.83) of engaging in walking for transport and cycling for transport at follow-up.²⁹

Social Norm

One study found that social norms have a negative impact on PA levels. Mertens and colleagues²⁹ found that older adults perceiving a higher social norm towards PA from family and friends had 2.08 times lower odds (95% CI = 0.34, 0.68) of engaging in cycling for transport at follow-up.

Loneliness

Four of the six articles that evaluated the relationship between PA and loneliness identified a positive effect.^{31,36,40,55} One scholar reported in an eight-week online training program that online exercise had a positive effect on physical, psychological, and social well-being, and that it was correlated with decreased

Table 2. Extracted Study Information From Review Sample.

Author (year)	Title	Country	Study design	N	PA measurement	Social factor measure(s)
Baez et al, ⁵⁵ 2017	Effects of online group exercises for older adults on physical, psychological and social wellbeing: a randomized pilot trial	Italy	RCT	37	Objective & self-reported—30 s chair stand test, timed up & go test, and RAPA	R-UCLA loneliness scale ⁶²
Bakhtari et al, 2019 ⁵⁸	Psychological, social, and environmental predictors of physical activity among older adults: The socio-ecological approach using structural equation modeling analysis	Iran	Cross-sectional	340	Self-reported—PASE short form	Social support scale for pa ⁶¹ , social interaction ⁶³
Chen et al, ⁵² 2021	Correlations of subjective and social well-being with sedentary behavior and physical activity in older Adults-A population-based study	Sweden	Cross-sectional	595	Objective—ActivPAL3	Author created
Crandall et al, ³⁵ 2012	Relationship of social connectedness with decreasing physical activity during the COVID-19 pandemic among older women participating in the women's health initiative study	United States	Experimental	41,443	Self-reported—single item	Author created
Harada et al, ⁴² 2019	Psychological and environmental correlates of moderate-to-vigorous physical activity and step counts among older adults with cognitive decline	Japan	Cross-sectional	262	Objective—GT40-020	Lubben social network scale ⁶⁴
Herbolsheimer et al, ⁵⁴ 2017	Relationship between social isolation and indoor and outdoor physical activity in community-dwelling older adults in Germany: Findings from the ActiFE study	Germany	Cross-sectional	1162	Objective—ActivPAL3	Lubben social network scale (LSNS-6) ⁶⁵
Kang et al, ⁶⁶ 2018	The impact of perceived social support, loneliness, and physical activity on quality of life in South Korean older adults	South Korea	Cross-sectional	332	Self-reported—GLTEQ	Social support questionnaire (SSQ), UCLA loneliness scale ⁶²
Kaplan et al, ⁶⁷ 2001	Demographic and psychosocial correlates of physical activity in late life	Canada	Longitudinal	12,611	Self-reported—single item	Author created
Kendrick et al, ⁴³ 2018	Keeping active: Maintenance of physical activity after exercise programmes for older adults	United Kingdom	Longitudinal	731	Self-reported—CHAMPS PA	Lubben social network scale (LSNS-6), ⁶⁵ multidimensional scale of perceived social support (MSPSS) ⁶⁸

(continued)

Table 2. (continued)

Author (year)	Title	Country	Study design	N	PA measurement	Social factor measure(s)
Kim & Kosma, ⁴⁶ 2013	Psychosocial and environmental correlates of physical activity among Korean older adults	South Korea	Cross-sectional	290	Self-reported—single item	Social support scale for PA ⁶¹
Koning et al, 2019 ⁴⁴	Loneliness, social isolation, and objectively measured physical activity in rural-living older adults	United Kingdom	Cross-sectional	112	Objective—ActiGraph	3-item UCLA loneliness scale ⁶²
Lee et al, ³³ 2020a	Psycho-social correlates of leisure-time physical activity (LTPA) among older adults: a multivariate analysis	United States	Cross-sectional	10,700	Self-reported—single item	Author created
Lee, ²⁸ 2020b	Perceived neighborhood environment associated with older adults' walking and positive affect: Results from the health and retirement study	United States	Cross-sectional	10,700	Self-reported—single item	Author created
McKay et al, 2021 ³⁶	Status quo or drop-off: Do older adults maintain benefits from choose to Move-A scaled-up physical activity Program-12 Months after withdrawing the intervention?	United States	RCT	235	Self-reported—single item	3-item loneliness Scale, ⁶⁹ 5-item social isolation scale ^{70,71}
McMahon et al, 2017 ³⁸	Assessing the effects of interpersonal and intrapersonal behavior change strategies on physical activity in older adults: a factorial experiment	Canada	RCT	102	Objective—fitbit OneTM	Author created
McMahon et al, 2020 ³⁷	Examining potential psychosocial mediators in a physical activity intervention for older adults	Canada	RCT	102	Objective—fitbit OneTM	Social support scale for PA ⁶¹
Mertens et al, ²⁹ 2019	Individual, social, and physical environmental factors related to changes in walking and cycling for transport among older adults: a longitudinal study	United States	Longitudinal	438	Self-reported—IPAQ	Author created
Newall et al, ⁴⁰ 2013	Consequences of loneliness on physical activity and mortality in older adults and the power of positive emotions	Canada	Cross-sectional	228	Objective—ActiGraph	11-item De Jong gierveld loneliness scale (DGLS-6) ⁷²
Nieboer et al, 2019 ⁵⁷	Enabling and disabling behaviors in the social environment are associated with physical activity of older people in the Netherlands	Netherlands	Cross-sectional	1280	Self-reported—single item	Perceived social influence on health behavior (PSI-HB) ⁷³

(continued)

Table 2. (continued)

Author (year)	Title	Country	Study design	N	PA measurement	Social factor measure(s)
Okoye et al, ⁷⁴ 2022	Social support, general self-efficacy, fear of falling, and physical activity among older adults in a middle-income country	Nigeria	Cross-sectional	100	Self-reported—12-item PA scale	12-item multidimensional scale of perceived social support (MSPSS) ⁶⁸
Otaki et al, ⁴¹ 2022	Social contact impacts physical activity and sedentary behavior among older adults in Japan due to COVID-19	Japan	Cross-sectional	1925	Self-reported—IPAQ	Short form 36 health survey questionnaire (SF-36) ⁷⁵
Pérez et al, ⁷⁶ 2021	Depressive symptoms, fatigue and social relationships influenced physical activity in frail older community-dwellers during the Spanish lockdown due to the COVID-19 pandemic	Spain	Cross-sectional	107	Self-reported—BPAAT	Author created
Perrino et al, ⁷⁷ 2011	Depressive symptoms, social support, and walking among hispanic older adults	United States	Cross-sectional	212	Self-reported—7 d recall	10-item social support ⁷⁸
Robins et al, ⁴⁷ 2018	The association between physical activity and social isolation in community-dwelling older adults	Australia	Cross-sectional	245	Self-reported—FITT PA	The friendship scale (a measure of social isolation) ⁷⁹
Robins et al, ⁴⁸ 2018	Social isolation, physical capacity, and physical activity in older community-dwelling adults post-hospitalization	Australia	Cross-sectional	218	Self-reported—FITT PA	The friendship scale (a measure of social isolation) ⁷⁹
Shores et al, ³⁴ 2009	Extra-individual correlates of physical activity attainment in rural older adults	United States	Cross-sectional	454	Self-reported—7 d recall	Author created
Sjöberg et al, ⁵¹ 2022	Factors associated with physical activity reduction in Swedish older adults during the first COVID-19 outbreak: a longitudinal population-based study	Sweden	Longitudinal	624	Self-reported—single item	Author created
Taani et al, ²⁷ 2022	Self-management processes, sedentary behavior, physical activity and dietary self-management behaviors: impact on muscle outcomes in continuing care retirement community residents	United States	Cross-sectional	105	Objective—ActiGraph	Social influence scale (SIS) ⁸⁰
Thornton et al, ³² 2017	Physical activity in older adults: an ecological approach	United States	Cross-sectional	726	Objective & self-reported—ActiGraph and CHAMPS PA	Social support scale for PA ⁶¹

(continued)

Table 2. (continued)

Author (year)	Title	Country	Study design	N	PA measurement	Social factor measure(s)
Tully et al, ⁶⁰ 2019	Is sedentary behavior or physical activity associated with loneliness in older adults? Results of the European-wide SITLESS study	Denmark, Spain, Germany, and the United Kingdom	Cross-sectional	1360	Objective—ActiGraph	Lubben social network scale (LSNS-6), ⁶⁵ de Jong Gierveld loneliness scale (DGLS-6) ⁷²
Van cauwenberg et al, ⁴⁹ 2014	Relationships between the perceived neighborhood social environment and walking for transportation among older adults	Belgium	Cross-sectional	50,986	Self-reported—single item	Author created
Van holle et al, ⁵⁰ 2016	Interactions between neighborhood social environment and walkability to explain Belgian older adults' physical activity and sedentary time	Belgium	Cross-sectional	431	Objective & self-reported—ActiGraph and IPAQ	Author created
Warner et al, ⁵³ 2011	Synergistic effect of social support and self-efficacy on physical exercise in older adults	Germany	Longitudinal	309	Self-reported—7 d recall	Social support scale for PA ⁶¹
Yang et al, ³¹ 2022	The influence of loneliness on the smoking and physical activity of community-dwelling older adults: Results from the health and retirement study	United States	Longitudinal	3018	Self-reported—single item	11-item adapted UCLA loneliness scale, ⁶² author created (social network)

Abbreviations: RCT, Randomized Controlled Trials; CHAMPS, Community Health Activities Model Program for Seniors; IPAQ, International Physical Activity Questionnaire; PA, physical activity; PASE, GLTEQ, Godin Leisure-Time Exercise Questionnaire; Physical Activity Scale for the Elderly; 7d recall, 7-day PA recall; RAPA, Rapid Assessment of Physical Activity; BPAAT, Brief Physical Activity Assessment Tool; FITT, Frequency, Intensity, Time and Type.

Table 3. Summary of Association Between Physical Activity and Social Constructs.

Constructs measured	Positive association	Null association	Negative association	Other	References
	N (%)	N (%)	N (%)	N (%)	
Social network	7 (77.78%)	1 (11.11%)	1 (11.11%)	-	31,33,35,37,38,42,43,51,52
Social support	15 (93.76%)	1 (6.25%)	-	-	27,32,34,37,42,43,46,49,51-53,58,66,67,74,77
Social interaction	5 (100%)	-	-	-	29,41,50,58,76
Social influence	1 (100%)	-	-	-	57
Social cohesion	1 (50%)	-	1 (50%)	-	28,29
Social norm	-	-	1 (100%)	-	29
Loneliness	4 (66.66%)	1 (16.67%)	-	1 (16.67%)	31,36,40,44,55,66
Social isolation	4 (66.67%)	2 (33.33%)	-	-	36,44,47,48,54,60
Social participation	2 (100%)	-	-	-	41,52

Note: Other denotes instances where the variable was measured and utilized in moderation, mediation, indirect effects, or where its association with physical activity was not reported. The associations listed indicate the number of papers in which the association was observed, rather than providing counts or measures of the individual associations' strength. It is important to acknowledge that the references categorized under the construct may have employed different measurement approaches and diverse methods of analysis to establish the associations between the construct and physical activity. Caution is advised when interpreting the overall associations.

loneliness in both the experimental and control groups participating in online training programs.⁵⁵ In addition, McKay and colleagues reported that social isolation and loneliness in older adults aged 75 or older were reduced by providing activity coaches during the six-month intervention period.³⁶ The results of a regression analysis conducted in a study by Newall also showed that loneliness longitudinally predicts perceived PA and mortality. However, studies by De Koning and colleagues⁴⁴ revealed that the single-question loneliness scale and UCLA loneliness scale were independent of physical activity, and consistently, in a controlled regression model, no PA variable reduced the likelihood of loneliness variables ($P < .003$). Also, Kang found no association with PA, as loneliness in active older adults in South Korea mediated the relationship between perceived social support and PA and quality of life.⁶⁶

Social Isolation

Four studies reported a positive association between social isolation and PA.^{36,47,48,54} Specifically, a study by Herbolzheimer reported that socially isolated older adults participated in 7.8 minutes per day less in PA than non-isolated people ($P = .007$), and families and socially isolated people were more likely to participate in sedentary behavior for 4.5 minutes more per day. Furthermore, two studies by Robin suggested that home-based PA is related to the social isolation of the older adults living in the community.^{47,48} These two studies reported that improvement in physical ability was associated with reduced social isolation (-0.65 , $CI = -1.21, -0.09$), and that home-based PA (0.03 , $CI = 0.001, 0.06$) was associated with more contact with relatives.^{47,48} In contrast, two studies argue that PA is not necessarily associated with social isolation in older adults.^{44,60} For example, Tully and colleagues⁶⁰ demonstrated that PA was not associated with social isolation and was not a statistically significant predictor of social isolation in 2660 older adults in four European countries (Denmark, Spain, Germany, and the United Kingdom).

Social Participation

Both studies that examined the relationship between PA and social participation reported a positive correlation.^{41,52} A study by Chen surveyed 595 older adults living in Denmark over the age of 66 and reported that high levels of social participation were associated with more time spent on low-intensity PA.⁵² The Otaki's study also surveyed 1925 senior citizens aged 65 or older living in Japan and revealed that PA is significantly related to social participation ($B = -0.209$; 95% $CI: -0.248, -0.79$; $P < 0.001$), indicating that continuous monitoring and support of social activities of older adults is essential.⁴¹

Discussion

The results of this systematic literature review reaffirm that social factors are important determinants of PA among older

adults. Specifically, factors such as expansive social networks, supportive family environments, social support, neighborhood communities regarding PA, and favorable social interactions were positively associated with PA among older adults. Conversely, insufficient social support and obstructive factors (eg, loneliness and social isolation) within the social environment exhibited negative associations with PA.

Our results indicate that social support and social networks have the strongest evidence base for their associations with PA. The review found that two key social factors—social support and social networks—had a relatively larger body of evidence demonstrating their association with PA in older adults. In contrast, the associations of other social factors, such as social cohesion and loneliness, were less consistently observed across studies. For example, some interventions that focused on increasing social support for PA trained older adults' family members and friends to provide social support, and other social network interventions aimed to enhance the size and strength of social networks. These findings are consistent with previous research that has emphasized the significance of social support and social networks in relation to PA among older adults.⁸¹ A meta-analysis conducted by Rebar and colleagues⁸² identified social support as one of the most consistent predictors of PA in older adults. Our study extends these prior reviews by pinpointing specific social factors associated with PA among older adults and reinforces this important theme about the significance of social support and interaction to promote PA among older adults.

Our assessment identified that additional studies on the relationship between social cohesion/social norms and PA are needed in the future. Social norms were observed from one article in this study, but contrary to our expectations and previous findings, older adults who perceived high social norms towards PA were less likely to participate in ride cycling for transport.²⁹ However, according to Van Holle and colleagues' review study, a positive association was observed between social norms towards PA and PA engagement among older adults,⁸³ and this result contradicts our finding. Therefore, future studies should repeatedly investigate the social norms and PA participation of older adults, prioritizing the use of validated instruments like the Lubben Social Network Scale⁶⁵ to address the challenges in standardizing the assessment of social networks due to variability in measurement tools. Additionally, two articles that studied social cohesion showed conflicting results. Lee's study reported that neighborhood social cohesion positively affected walking engagement in 10,700 US older adults aged over 65 years old,²⁸ while Mertens and colleagues,²⁹ study showed that social cohesion was less likely to engage in walking for transport in 438 Belgian older adults. Most of the previous studies about social cohesion and PA have reported positive results between social cohesion and PA as cross-sectional studies,^{49,84,85} but Mertens's research had a difference from previous studies as longitudinal studies. Therefore, further

longitudinal studies related to social cohesion and PA should be conducted to demonstrate the relationship.

Among the literature reviewed in this study, previous studies related to loneliness and social isolation showed that they had a negative relationship with PA. Most participants shared information and their experiences with others, learned from their peers, shared familiar experiences, and contributed to the feeling of social connection through activities or interventions, including PA. These findings are consistent with the findings of Fabian who conducted a systematic literature analysis to study the relationship between loneliness and PA among older adults.⁸⁶ They analyzed 37 studies and found a negative correlation between loneliness and PA in 24 cross-sectional studies and reported that five PA intervention studies reduced loneliness. Considering practical implications, our findings suggest that PA promotion or exercise intervention programs can buffer negative emotions, such as social isolation and loneliness, among older adults. Regularly participating in aerobic and/or anaerobic PA may be used to alleviate mild and moderate symptoms of loneliness and social isolation based on psychosocial mechanisms such as distraction from aversive stimuli, fostering efficacy, and instilling beliefs of control.⁸⁷ Conversely, although there is only one study, it reported no significant association between loneliness and physical activity, highlighting the need to consider individual variability and contextual factors that may influence these dynamics. The heterogeneity in findings also underscores the importance of distinguishing between loneliness (a subjective feeling) and social isolation (an objective state) and exploring how each uniquely affects physical activity behaviors.

Our findings have important implications for future research on PA among older adults. First, future studies should focus on identifying the specific mechanisms through which social support, social networks, and social norms influence PA among older adults. Second, future studies should concentrate on developing and testing interventions that target specific social factors to promote PA among older adults. Finally, future studies should prioritize identifying the most effective ways to tailor interventions to the unique needs and preferences of older adults, considering individual and social factors that influence PA within the aging population.

One major theme that emerges is the need for more research to explore factors that influence long-term PA maintenance among older adults. This encompasses a need for more studies to assess the predictive value of these factors for individual-level PA maintenance and guide the design of exercise programs for older adults. In our review, maintenance of PA could be particularly valuable for promoting active transportation, which exhibited positive associations with neighborhood aesthetics and the social environment, and healthcare systems may also want to prioritize interventions for populations that are less likely to maintain PA levels beyond the end of their programs. Additionally, since exercise self-efficacy and social support for exercise have been identified as significant predictors of physical exercise frequency among older adults with

multiple illnesses,⁵³ these factors should be taken into consideration to change health behaviors.

Limitations

The study utilized multiple databases, reviewers, and Covidence academic search software to meticulously collect articles that fulfilled the specified inclusion criteria. Nonetheless, there remains a possibility that some articles meeting the inclusion criteria may have been unintentionally omitted, which is a limitation that can be encountered in all systematic literature reviews. Furthermore, the study's sample size may have been limited due to its exclusive reliance on articles published in English. Future investigations have the potential to enhance the quality assessment tools employed, leading to a more substantial contribution to the overall quality of the examined studies. Additionally, one of the primary limitations is the variability in measurement tools used across studies. This review identified a total of 12 author-created measures for assessing socialization-related variables, which raises concerns regarding the validity and reliability of these instruments. While some studies reported acceptable levels of internal consistency (eg, Cronbach's $\alpha > 0.70$), many author-created measures may lack the extensive validation processes that standardized instruments undergo. This limitation implies that some findings regarding the association between socialization-related variables and PA could be influenced by measurement bias, which can affect the strength and direction of observed associations. Lastly, while there is sufficient evidence to make statements regarding the associations between social support and social network and PA, other variables such as social participation, social isolation, and social influence were investigated in fewer studies, limiting the ability to generalize their effects. Future research should aim to explore these variables more extensively to develop a comprehensive understanding of how they individually impact PA among older adults.

Conclusions

Our findings suggest that the social environment plays a strong role in determining PA levels among older adults. Interventions aimed at promoting PA within the aging population could prioritize strategies such as enhancing social support and social networks towards PA. It is important to acknowledge sex differences and tailor interventions accordingly to ensure their effectiveness. Future research should concentrate on identifying the specific mechanisms through which social factors influence PA among older adults. Additionally, there is a need for the development and testing of interventions that specifically target these social factors. By further exploring these areas, we can gain a deeper understanding of how to effectively promote PA among older adults and inform the development of evidence-based interventions.

So What?

Numerous studies have underscored the importance of PA for older adults in maintaining health and well-being. However, a significant portion of this demographic fails to meet recommended PA guidelines, which can lead to various chronic illnesses and decreased quality of life. This article presents a systematic literature review focusing on social factors influencing PA among older adults. It synthesizes findings from various studies, emphasizing the role of social support, social networks, social norms, loneliness, and social interaction in PA engagement among older adults. The review emphasizes the impact of social support, networks, norms, loneliness, and interaction on PA engagement. It suggests tailored interventions focusing on enhancing social support and addressing specific social barriers. Furthermore, it urges researchers to explore how social factors affect PA and to consider sex differences in interventions. Future research should investigate long-term PA maintenance factors and prioritize interventions promoting active transportation.

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References

1. Rhodes RE, Janssen I, Bredin SS, Warburton DE, Bauman A. Physical activity: health impact, prevalence, correlates and interventions. *Psychol Health*. 2017;32(8):942-975.
2. Krueger H, Krueger J, Koot J. Variation across Canada in the economic burden attributable to excess weight, tobacco smoking and physical inactivity. *Can J Public Health*. 2015;106:e171-e177.
3. Jacobs JM, Rottenberg Y, Cohen A, Stessman J. Physical activity and health service utilization among older people. *J Am Med Dir Assoc*. 2013;14(2):125-129.
4. Control CfD, Prevention. *CDC Yellow Book 2020: Health Information for International Travel*. Oxford, UK: Oxford University Press; 2019.
5. Lee I-M, Shiroma EJ, Lobelo F, Puska P, Blair SN, Katzmarzyk PT, Lancet Physical Activity Series Working Group. Effect of physical inactivity on major non-communicable diseases worldwide: an analysis of burden of disease and life expectancy. *The lancet*. 2012;380(9838):219-229.
6. Anderson E, Durstine JL. Physical activity, exercise, and chronic diseases: a brief review. *Sports Med Health Sci*. 2019;1(1):3-10.
7. Goodson P. *Researching Genes, Behavior, and Society to Improve Population Health: A Primer in Complex Adaptive Systems as an Integrative Approach*. Genetics, Health and Society. Leeds, UK: Emerald Group Publishing Limited; 2015:127-156.
8. Goodson P. Theory in health promotion research and practice: thinking outside the box: thinking outside the box. *Jones & Bartlett Publishers*. 2009;20(2):148.
9. Stathi A, Gilbert H, Fox KR, Coulson J, Davis M, Thompson JL. Determinants of neighborhood activity of adults age 70 and over: a mixed-methods study. *J Aging Phys Activ*. 2012;20(2):148-170.
10. Prince S, Reed J, Martinello N, et al. Why are adult women physically active? A systematic review of prospective cohort studies to identify intrapersonal, social environmental and physical environmental determinants. *Obes Rev*. 2016;17(10):919-944.
11. Sasidharan V, Payne L, Orsega-Smith E, Godbey G. Older adults' physical activity participation and perceptions of well-being: examining the role of social support for leisure. *Manag Leisure*. 2006;11(3):164-185.
12. Liao Y, Shonkoff ET, Dunton GF. The acute relationships between affect, physical feeling states, and physical activity in daily life: a review of current evidence. *Front Psychol*. 2015;6:1975.
13. Smith G, Banting L, Eime R, O'Sullivan G, Van Uffelen JG. The association between social support and physical activity in older adults: a systematic review. *Int J Behav Nutr Phys Activ*. 2017;14:1-21.
14. Son JS, Nimrod G, West ST, Janke MC, Liechty T, Naar JJ. Promoting older adults' physical activity and social well-being during COVID-19. *Leisure Sci*. 2021;43(1-2):287-294.
15. McAuley E, Blissmer B, Marquez DX, Jerome GJ, Kramer AF, Katula J. Social relations, physical activity, and well-being in older adults. *Prev Med*. 2000;31(5):608-617.
16. Higuera-Fresnillo S, Cabanas-Sánchez V, García-Esquinas E, Rodríguez-Artalejo F, Martínez-Gómez D. Physical activity attenuates the impact of poor physical, mental, and social health on total and cardiovascular mortality in older adults: a population-based prospective cohort study. *Qual Life Res*. 2018;27:3293-3302.
17. Lindsay Smith G, Banting L, Eime R, O'Sullivan G, Van Uffelen JG. The association between social support and physical activity in older adults: a systematic review. *Int J Behav Nutr Phys Activ*. 2017;14:56.
18. Rhodes RE, Smith N. Personality correlates of physical activity: a review and meta-analysis. *Br J Sports Med*. 2006;40(12):958-965.
19. Kelly EL, Moen P, Oakes JM, et al. Changing work and work-family conflict: evidence from the work, family, and health network. *Am Socio Rev*. 2014;79(3):485-516.

20. Sallis JF, Owen N, Fotheringham MJ. Behavioral epidemiology: a systematic framework to classify phases of research on health promotion and disease prevention. *Ann Behav Med.* 2000;22(4):294-298.
21. Prochnow T, Patterson MS. Assessing social network influences on adult physical activity using social network analysis: a systematic review. *Am J Health Promot.* 2022;36(3):537-558. doi:[10.1177/08901171211060701](https://doi.org/10.1177/08901171211060701)
22. Lindsay Smith G, Banting L, Eime R, O'Sullivan G, van Uffelen JGZ. The association between social support and physical activity in older adults: a systematic review. *Int J Behav Nutr Phys Activ.* 2017;14(1):56. doi:[10.1186/s12966-017-0509-8](https://doi.org/10.1186/s12966-017-0509-8)
23. Prochnow T, Curran LS, Amo C, Patterson MS. Bridging the built and social environments: a systematic review of studies investigating influences on physical activity. *J Phys Activ Health.* 2023;20(5):438-459.
24. Innovation VH. Covidence systematic review software. Melbourne, Australia. 2017.
25. Von Elm E, Altman DG, Egger M, Pocock SJ, Gøtzsche PC, Vandenbroucke JP, STROBE Initiative. The strengthening the reporting of observational studies in epidemiology (STROBE) statement: guidelines for reporting observational studies. *Lancet.* 2007;370(9596):1453-1457.
26. Tooth L, Ware R, Bain C, Purdie DM, Dobson A. Quality of reporting of observational longitudinal research. *Am J Epidemiol.* 2005;161(3):280-288.
27. Taani MH, Strath SJ, Schiffman R, et al. Self-management processes, sedentary behavior, physical activity and dietary self-management behaviors: impact on muscle outcomes in continuing care retirement community residents. *BMC Geriatr.* 2022;22(1):48.
28. Lee S. Perceived neighborhood environment associated with older adults' walking and positive affect: results from the health and retirement study. *J Aging Phys Activ.* 2020;29(3):536-543.
29. Mertens L, Van Dyck D, Deforche B, De Bourdeaudhuij I, Brondeel R, Van Cauwenberg J. Individual, social, and physical environmental factors related to changes in walking and cycling for transport among older adults: a longitudinal study. *Health Place.* 2019;55:120-127.
30. Perrino T, Brown SC, Huang S, et al. Depressive symptoms, social support, and walking among Hispanic older adults. *J Aging Health.* 2011;23(6):974-993.
31. Yang J, Yockey RA, Chu Y, Lee JG. The influence of loneliness on the smoking and physical activity of community-dwelling older adults: results from the Health and Retirement Study. *Am J Health Promot.* 2022;36(6):959-966.
32. Thornton CM, Kerr J, Conway TL, et al. Physical activity in older adults: an ecological approach. *Ann Behav Med.* 2017;51(2):159-169.
33. Lee S, Lee C, An J. Psycho-social correlates of leisure-time physical activity (LTPA) among older adults: a multivariate analysis. *Eur Rev Aging Phys Act.* 2020;17(1):6-7.
34. Shores KA, West ST, Theriault DS, Davison EA. Extra-individual correlates of physical activity attainment in rural older adults. *J Rural Health.* 2009;25(2):211-218.
35. Crandall CJ, Larson J, Wiley Cene C, et al. Relationship of social connectedness with decreasing physical activity during the COVID-19 pandemic among older women participating in the Women's Health Initiative Study. *J Gerontol A Biol Sci Med Sci.* 2022;77(Supplement_1):S22-S30.
36. McKay HA, Nettlefold L, Sims-Gould J, Macdonald HM, Khan KM, Bauman A. Status quo or drop-off: do older adults maintain benefits from choose to move—a scaled-up physical activity program—12 Months after withdrawing the intervention? *J Phys Activ Health.* 2021;18(10):1236-1244.
37. McMahon SK, Lewis B, Oakes JM, Wyman JF, Guan W, Rothman AJ. Examining potential psychosocial mediators in a physical activity intervention for older adults. *West J Nurs Res.* 2020;42(8):581-592.
38. McMahon SK, Lewis B, Oakes JM, Wyman JF, Guan W, Rothman AJ. Assessing the effects of interpersonal and intra-personal behavior change strategies on physical activity in older adults: a factorial experiment. *Ann Behav Med.* 2017;51(3):376-390.
39. Kaplan MS, Newsom JT, McFarland BH, Lu L. Demographic and psychosocial correlates of physical activity in late life. *Am J Prev Med.* 2001;21(4):306-312.
40. Newall NE, Chipperfield JG, Bailis DS, Stewart TL. Consequences of loneliness on physical activity and mortality in older adults and the power of positive emotions. *Health Psychol.* 2013;32(8):921-924.
41. Otaki N, Yokoro M, Yano M, et al. Social contact impacts physical activity and sedentary behavior among older adults in Japan due to COVID-19. *BMC Geriatr.* 2022;22(1):491-498.
42. Harada K, Lee S, Lee S, et al. Psychological and environmental correlates of moderate-to-vigorous physical activity and step counts among older adults with cognitive decline. *Percept Mot Skills.* 2019;126(4):639-655.
43. Kendrick D, Orton E, Lafond N, et al. Keeping active: maintenance of physical activity after exercise programmes for older adults. *Publ Health.* 2018;164:118-127. doi:[10.1016/j.puhe.2018.08.003](https://doi.org/10.1016/j.puhe.2018.08.003)
44. De Koning J, Richards S, Stathi A. Loneliness, social isolation, and objectively measured physical activity in rural-living older adults. *J Aging Phys Activ.* 2019;28(3):467-477.
45. Kang H-W, Park M, Wallace Hernandez JP. The impact of perceived social support, loneliness, and physical activity on quality of life in South Korean older adults. *J Sport Health Sci.* 2018;7(2):237-244.
46. Kim Y, Kosma M. Psychosocial and environmental correlates of physical activity among Korean older adults. *Res Aging.* 2013;35(6):750-767.
47. Robins LM, Hill KD, Finch CF, Clemson L, Haines T. The association between physical activity and social isolation in community-dwelling older adults. *Aging Ment Health.* 2018;22(2):175-182.
48. Robins LM, Brown T, Lalor AF, Stolwyk R, McDermott F, Haines T. Social isolation, physical capacity, and physical activity in older community-dwelling adults post-hospitalization. *J Aging Phys Activ.* 2018;26(2):204-213.

49. Van Cauwenberg J, De Donder L, Clarys P, et al. Relationships between the perceived neighborhood social environment and walking for transportation among older adults. *Soc Sci Med*. 2014;104:23-30.
50. Van Holle V, Van Cauwenberg J, De Bourdeaudhuij I, Deforche B, Van de Weghe N, Van Dyck D. Interactions between neighborhood social environment and walkability to explain Belgian older adults' physical activity and sedentary time. *Int J Environ Res Publ Health*. 2016;13(6):569.
51. Sjöberg L, Triolo F, Saadeh M, Dekhtyar S, Calderón-Larrañaga A, Welmer A-K. Factors associated with physical activity reduction in Swedish older adults during the first COVID-19 outbreak: a longitudinal population-based study. *Eur Rev Aging Phys Act*. 2022;19(1):9-10.
52. Chen S, Calderón-Larrañaga A, Saadeh M, Dohrn I-M, Welmer A-K. Correlations of subjective and social well-being with sedentary behavior and physical activity in older adults—a population-based study. *J Gerontol A Biol Sci Med Sci*. 2021;76(10):1789-1795.
53. Warner LM, Ziegelmann JP, Schüz B, Wurm S, Schwarzer R. Synergistic effect of social support and self-efficacy on physical exercise in older adults. *J Aging Phys Activ*. 2011;19(3):249-261.
54. Herbolzheimer F, Mosler S, Peter R, ActiFE Ulm Study Group. Relationship between social isolation and indoor and outdoor physical activity in community-dwelling older adults in Germany: findings from the ActiFE study. *J Aging Phys Activ*. 2017;25(3):387-394.
55. Baez M, Far IK, Ibarra F, Ferron M, Didino D, Casati F. Effects of online group exercises for older adults on physical, psychological and social wellbeing: a randomized pilot trial. *PeerJ*. 2017;5:e3150.
56. Pérez LM, Castellano-Tejedor C, Cesari M, et al. Depressive symptoms, fatigue and social relationships influenced physical activity in frail older community-dwellers during the Spanish lockdown due to the COVID-19 pandemic. *Int J Environ Res Publ Health*. 2021;18(2):808.
57. Nieboer AP, Cramm JM. Enabling and disabling behaviors in the social environment are associated with physical Activity of older people in The Netherlands. *BMC Publ Health*. 2019;19:361-367.
58. Bakhtar F, Ahmad B, Aminisani N, Gilani N, Allahverdipou H. Psychological, social, and environmental predictors of physical activity among older adults: the socio-ecological approach using structural equation modeling analysis. *Baltic J Health Phys Act*. 2019;11(2):117-126.
59. Okoye EC, Onwuakagba IU, Akile CC, et al. Social support, general self-efficacy, fear of falling, and physical activity among older adults in a middle-income country. *Gerontol Geriatr Med*. 2022;8:23337214221097750.
60. Tully MA, McMullan II, Blackburn NE, et al. Is sedentary behavior or physical activity associated with loneliness in older adults? Results of the European-wide SITLESS study. *J Aging Phys Activ*. 2019;28(4):549-555.
61. Sallis JF, Grossman RM, Pinski RB, Patterson TL, Nader PR. The development of scales to measure social support for diet and exercise behaviors. *Prev Med*. 1987;16(6):825-836.
62. Russell D, Peplau LA, Cutrona CE. The revised UCLA Loneliness Scale: concurrent and discriminant validity evidence. *J Pers Soc Psychol*. 1980;39(3):472-480.
63. Lovell GP, El Ansari W, Parker JK. Perceived exercise benefits and barriers of non-exercising female university students in the United Kingdom. *Int J Environ Res Publ Health*. 2010;7(3):784-798.
64. Kurimoto A, Awata S, Ohkubo T, et al. Reliability and validity of the Japanese version of the abbreviated lubben social network scale. *Nihon Ronen Igakkai Zasshi*. 2011;48(2):149-157.
65. Lubben J, Blozik E, Gillmann G, et al. Performance of an abbreviated version of the Lubben Social Network Scale among three European community-dwelling older adult populations. *Gerontol*. 2006;46(4):503-513.
66. Kang HW, Park M, Wallace Hernandez JP. The impact of perceived social support, loneliness, and physical activity on quality of life in South Korean older adults. *J Sport Health Sci*. 2018;7(2):237-244. doi:10.1016/j.jshs.2016.05.003
67. Kaplan MS, Newsom JT, McFarland BH, Lu L. Demographic and psychosocial correlates of physical activity in late life. *Am J Prev Med*. 2001;21(4):306-312. doi:10.1016/s0749-3797(01)00364-6
68. Zimet GD, Dahlem NW, Zimet SG, Farley GK. The multidimensional scale of perceived social support. *J Pers Assess*. 1988;52(1):30-41.
69. Hughes ME, Waite LJ, Hawkey LC, Cacioppo JT. A short scale for measuring loneliness in large surveys: results from two population-based studies. *Res Aging*. 2004;26(6):655-672.
70. Franke T, Sims-Gould J, Nettlefold L, Ottoni C, McKay HA. "It makes me feel not so alone": features of the choose to move physical activity intervention that reduce loneliness in older adults. *BMC Publ Health*. 2021;21(1):312. doi:10.1186/s12889-021-10363-1
71. Veroff J, Kulka RA, Douvan EAM. *Mental Health in America: Patterns of Help-Seeking from 1957 to 1976: Patterns of Help-Seeking from 1957 to 1976*. New York, NY: Basic Books; 1981.
72. De Jong-Gierveld J, Kamphuis F. The development of a Rasch-type loneliness scale. *Appl Psychol Meas*. 1985;9(3):289-299.
73. Holt CL, Clark EM, Roth DL, et al. Development and validation of an instrument to assess perceived social influence on health behaviors. *J Health Psychol*. 2010;15(8):1225-1235. doi:10.1177/1359105310365178
74. Okoye EC, Onwuakagba IU, Akile CC, et al. Social support, general self-efficacy, fear of falling, and physical activity among older adults in a middle-income country. *Gerontol Geriatr Med*. 2022;8:23337214221097750. doi:10.1177/23337214221097750
75. Fukuhara S, Bito S, Green J, Hsiao A, Kurokawa K. Translation, adaptation, and validation of the SF-36 Health Survey for use in Japan. *J Clin Epidemiol*. 1998;51(11):1037-1044.
76. Pérez LM, Castellano-Tejedor C, Cesari M, et al. Depressive symptoms, fatigue and social relationships influenced physical activity in frail older community-dwellers during the Spanish lockdown due to the COVID-19 pandemic. *Int J Environ Res Publ Health*. 2021;18:808. doi:10.3390/ijerph18020808
77. Perrino T, Brown SC, Huang S, et al. Depressive symptoms, social support, and walking among Hispanic older adults. *J Aging Health*. 2011;23(6):974-993. doi:10.1177/0898264311404235

78. Krause N, Markides K. Measuring social support among older adults. *Int J Aging Hum Dev*. 1990;30(1):37-53. doi:[10.2190/cy26-xckw-wy1v-vgk3](https://doi.org/10.2190/cy26-xckw-wy1v-vgk3)
79. Hawthorne G. Perceived social isolation in a community sample: its prevalence and correlates with aspects of peoples' lives. *Soc Psychiatr Psychiatr Epidemiol*. 2008;43(2):140-150. doi:[10.1007/s00127-007-0279-8](https://doi.org/10.1007/s00127-007-0279-8)
80. Chogahara M. A multidimensional scale for assessing positive and negative social influences on physical activity in older adults. *J Gerontol B Psychol Sci Soc Sci*. 1999;54(6): S356-S367.
81. Ory MG, Lee S, Han G, et al. Effectiveness of a lifestyle intervention on social support, self-efficacy, and physical activity among older adults: evaluation of texercise select. *Int J Environ Res Publ Health*. 2018;15(2):234.
82. Rebar AL, Dimmock JA, Jackson B, et al. A systematic review of the effects of non-conscious regulatory processes in physical activity. *Health Psychol Rev*. 2016;10(4):395-407.
83. Van Holle V, Deforche B, Van Cauwenberg J, et al. Relationship between the physical environment and different domains of physical activity in European adults: a systematic review. *BMC Publ Health*. 2012;12(1):807-817.
84. Cerin E, Nathan A, Van Cauwenberg J, Barnett DW, Barnett A, Council on Environment and Physical Activity CEPA – Older Adults working group. The neighbourhood physical environment and active travel in older adults: a systematic review and meta-analysis. *Int J Behav Nutr Phys Activ*. 2017;14(1):15-23.
85. Van Cauwenberg J, Clarys P, De Bourdeaudhuij I, et al. Physical environmental factors related to walking and cycling in older adults: the Belgian aging studies. *BMC Publ Health*. 2012;12(1): 142-143.
86. Pels F, Kleinert J. Loneliness and physical activity: a systematic review. *Int Rev Sport Exerc Psychol*. 2016;9(1):231-260.
87. Biddle SJ, Mutrie N. *Psychology of Physical Activity: Determinants, Well-Being and Interventions*. Oxfordshire, UK: Routledge; 2007.