

Chain Mediating Effect of Physical Activity and Psychological Resilience on Social Isolation and Psychological Well-Being in Community-Dwelling Older Adults

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ABSTRACT

PURPOSE: To explore the relationship between social isolation and psychological well-being among community-dwelling older adults and analyze the mediating role of physical activity and psychological resilience in the chain mediation effect between social isolation and psychological well-being.

METHOD: Two hundred sixty-five older adults from six communities in Baoding City were selected using convenience sampling. Social isolation, physical activity, psychological resilience, and psychological well-being were measured. The SPSS PROCESS program was used to test the chain mediation effect.

RESULTS: Pearson correlation analysis indicated significant relationships between psychological well-being and social isolation, psychological resilience, and physical activity (all $p < 0.001$). Mediation analysis results showed that social isolation directly affects psychological well-being and influences psychological well-being through three mediation chains: physical activity, psychological resilience, and the chain mediation effect of physical activity and psychological resilience. Total mediation effect accounted for 60% of the total effect.

CONCLUSION: Social isolation is a significant risk factor for decreased psychological well-being among older adults, and physical activity and psychological resilience serve as important explanatory mechanisms. Community health workers should prioritize the impact of social isolation on the psychological well-being of older adults and develop intervention strategies based on the pathways of physical activity and psychological resilience to enhance psychological well-being and promote healthy aging. [*Journal of Gerontological Nursing*, xx(x), xx-xx.]

According to the Ministry of Civil Affairs, by the end of 2022, the population of older adults aged ≥ 60 years in China reached 280 million, accounting for 19.8% of the total population (Peng, 2023). However, due to changes in family structure, declining health, increased retirement and leisure time, and social changes, older adults are prone to social isolation (Chen &

Schulz, 2016). Consequently, social isolation can lead to negative emotions, such as loneliness, depression, and anxiety in older adults (Freedman & Nicolle, 2020), thereby reducing their self-assessment of life quality, specifically their psychological well-being (Yueyan, 2015). Research indicates a negative correlation between social isolation and the psychological well-being of older adults, with high-

er levels of social isolation associated with lower psychological well-being (Cotterell et al., 2018).

Moreover, physical activity and psychological resilience are significant factors influencing the psychological well-being of older adults (Li et al., 2013; Yuhan, 2024). Physical activity promotes physical health, enhances immunity, reduces the occurrence of chronic diseases, and boosts psychological well-being and self-esteem among older adults (Liu & Zheng, 2024). Studies show a positive correlation between physical activity and the psychological well-being of older adults, indicating that higher levels of physical activity are associated with greater psychological well-being (Yongchao, 2023). Furthermore, *psychological resilience* refers to an individual's ability to adapt and recover when facing stress and adversity (Troy et al., 2023). Research suggests that older adults with higher psychological resilience are more likely to adapt to changes in social isolation, thereby maintaining a higher level of psychological well-being (St Clair-Thompson & London, 2024).

However, there is currently no research on the relationship among community-dwelling older adults' social isolation, physical activity, psychological resilience, and psychologi-

cal well-being. Therefore, the current study proposes the hypothesis that physical activity and psychological resilience may sequentially mediate the relationship between social isolation and psychological well-being among older adults. This research aims to investigate the mediating role of physical activity and psychological resilience, providing a basis for constructing intervention models to enhance psychological well-being among older adults in the future.

METHOD

Convenience sampling was used to select 265 older adults from six communities in Baoding City from November 2023 to March 2024. Inclusion criteria were aged ≥ 60 years, normal understanding and communication abilities, residency in the community for at least 1 year, and informed consent and voluntary participation. Exclusion criteria were sensory or language communication impairments, neurological disorders, or uncontrolled diseases.

Research Instruments

General Information Questionnaire. Designed by the researchers, the questionnaire included information regarding sex, age, ethnicity, educational level, current or previous occupation before retirement, marital status, presence of chronic diseases, history of surgery, use of mobility aids, presence of children, living situation, primary source of livelihood, hobbies and interests, and attitude toward community older adult care environment.

Chinese Version of the Social Isolation Scale in Older Adults (C-SIS).

Developed by Nicholson et al. (2020) and translated by Hui (2021), this scale includes two dimensions: connectedness and sense of belonging, each with three items scored on a 5-point Likert scale. The first three items are scored as 0 = 0, 1 = 1, 2 = 2 to 3, 3 = 4 to 5, and 4 = ≥ 6 ; the last three items are scored as 0 = *strongly disagree*, 1 = *somewhat disagree*, 2 = *neutral*, 3 = *somewhat agree*, and 4 = *strongly agree*. Total score ranges from 0 to 24, with lower score indicating a higher degree of social isolation. Cronbach's alpha coefficient for the total scale was 0.763 in the current study.

Physical Activity Scale for the Elderly (PASE). This scale, developed by Washburn et al. (1993), measures leisure, household, and occupational activities through self-reporting. The PASE comprises 10 items scored based on frequency and type of activity, with total score ranging from 0 to 360. Scores ≥ 180 (50% of the maximum score of 360) indicate high physical activity levels, whereas scores < 180 indicate low physical activity levels.

10-Item Connor-Davidson Resilience Scale (CD-RISC-10). Developed by Connor and Davidson (2003) and simplified by Campbell-Sills and Stein (2007), this scale has been validated for use among Chinese populations. The CD-RISC-10 is scored on a 5-point Likert scale (0 = *never*, 1 = *rarely*, 2 = *sometimes*, 3 = *often*, 4 = *almost always*), with total score ranging from 0 to 40, with a higher score indicating greater psychological resilience.

Multiple Happiness Questionnaire (MHQ). This tool uses the Psychologi-

cal Well-Being module from the questionnaire developed by Miao and Gao (2008). The questionnaire comprises 33 items divided into six dimensions: friendly relations, health concern, vitality, personal growth, self-worth, and altruistic behavior. Each dimension score is calculated as the total score divided by the number of items in that dimension. Scores range from 1 to 7, with higher scores indicating stronger psychological well-being. Cronbach's alpha for each dimension ranged from 0.6742 to 0.9056 in the current study.

Survey Methodology and Quality Control

Before the survey, surveyors undergo standardized training to minimize subjective biases. During the survey, if respondents have questions, surveyors use standardized instructions for clarification. In cases of visual impairment or difficulty with writing, surveyors assist respondents objectively without leading them. Upon completion of the survey, questionnaires are collected on-site. Any omissions are ensured to be completed, and proxy-filled questionnaires are cross-verified multiple times. Data entry undergoes dual-person verification, and statistical experts are consulted throughout the statistical analysis process.

Statistical Analysis

Statistical analysis was conducted using IBM SPSS 26.0 and SPSS PROCESS 4.1 software. Normally distributed continuous variables are described using mean and standard deviation, whereas skewed distributions are described using median and interquartile range. For comparisons

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between psychological well-being and general data, *t* tests or analysis of variance (ANOVA) were used, and correlations were assessed using Pearson correlation analysis. The SPSS PROCESS 4.1 macro was used to test mediation models, specifically Model 6, using bootstrapping with 5,000 resamples to estimate standard errors and 95% confidence intervals (CIs). A CI excluding 0 indicates statistically significant mediation effects. A significance level of $p < 0.05$ was considered statistically significant.

Ethical Considerations

The current study was approved by the Ethics Committee of Hebei University Affiliated Hospital (Approval No. HDFYLL-KY-2024-101).

RESULTS

Psychological Well-Being

A total of 268 questionnaires were distributed, with 265 valid questionnaires returned, resulting in an effective response rate of 98.88%. Mean score for psychological well-being was 4.82 ($SD = 0.84$). Specific dimensions of psychological well-being were assessed as follows: vitality of life, 4.62 ($SD = 1.13$); health concern, 4.54 ($SD = 1.82$); self-worth, 5.32 ($SD = 1.01$); friendly relationships, 5.00 ($SD = 1.32$); altruistic behavior, 5.00 ($SD = 1.11$); and personal growth, 4.65 ($SD = 0.79$). In addition, the scores for social isolation, psychological resilience, and physical activity were 14.15 ($SD = 3.73$), 26.62 ($SD = 7.17$), and 130.32 ($SD = 65.24$), respectively.

Univariate Analysis of Psychological Well-Being

Results of the univariate analysis indicate statistically significant differences ($p < 0.001$) in the scores of psychological well-being among older adults across six variables: age, educational level, presence of chronic illnesses, living conditions, hobbies and interests, and attitudes toward community older adult care environments (Table 1).

TABLE 1

Effect of General Conditions on Older Adults' Psychological Well-Being (N = 265)

Variable	<i>n</i>	Psychological Well-Being (Mean, <i>SD</i>)	<i>t/F</i>	<i>p</i>
Age (years)			9.817	<0.001
60 to 69	148	5.01 (0.72)		
70 to 79	82	4.60 (0.86)		
≥80	35	4.49 (1.04)		
Educational level			3.524	<0.001
Elementary or lower	122	4.67 (0.78)		
Junior high	95	4.86 (0.83)		
High school or vocational	35	5.18 (0.73)		
College or higher	13	4.82 (0.84)		
Chronic illnesses			3.496	<0.001
None	62	5.08 (0.83)		
One	103	4.79 (0.89)		
Two	59	4.76 (0.69)		
Three or more	41	4.56 (0.85)		
Living situation			6.939	<0.001
With spouse	158	4.97 (0.74)		
With children	65	4.65 (0.85)		
Alone	31	4.31 (1.07)		
Other	11	4.95 (0.70)		
Hobbies			8.485	<0.001
None	75	4.49 (1.06)		
One	70	4.88 (0.75)		
Two or more	120	4.98 (0.66)		
Attitude toward community older adult care			10.581	<0.001
Neutral	132	4.67 (0.83)		
Satisfied	122	5.04 (0.78)		

TABLE 2

Correlation Analysis of Social Isolation, Psychological Resilience, Physical Activity, and Psychological Well-Being (*r*)

Dimension	Self-Worth	Personal Growth	Healthy Relationships	Altruistic Behavior	Vitality	Friendly Relations	Psychological Well-Being
Social isolation	-0.403	-0.313	-0.284	-0.382	-0.235	-0.341	-0.397
Psychological resilience	0.652	0.487	0.379	0.634	0.624	0.450	0.668
Physical activity	0.205	0.146	0.294	0.206	0.122	0.021	0.208

TABLE 3

Analysis of Psychological Well-Being, Social Isolation, Physical Activity, and Psychological Resilience in Older Adults (*N* = 265)

Dependent Variable	Predictor Variable	<i>R</i>	<i>R</i> ²	<i>F</i>	<i>b</i>	<i>t</i>	<i>p</i>
Physical activity	Social isolation	0.307	0.094	27.387	-5.378	-5.233	<0.001
Psychological resilience	Social isolation	0.349	0.122	18.130	-0.491	-4.194	<0.001
	Physical activity				0.019	2.824	<0.001
Psychological well-being	Social isolation	0.727	0.529	97.589	-0.035	-3.385	0.001
	Physical activity				0.003	4.789	<0.001
	Psychological resilience				0.066	12.485	<0.001
Psychological well-being	Social isolation	0.397	0.158	49.241	-0.090	-7.017	<0.001

Correlation Analysis Among Social Isolation, Psychological Resilience, Physical Activity, and Psychological Well-Being

Social isolation scores show positive correlations with psychological resilience and physical activity, as well as with psychological well-being scores ($r = 0.397, 0.668, 0.208$, respectively; all $p < 0.001$) (Table 2).

Chain Mediation Analysis of Physical Activity and Psychological Resilience Between Social Isolation and Psychological Well-Being

Common Method Bias Test. According to Harman's single-factor test, factor analysis was conducted on all items from the C-SIS, PASE,

CD-RISC-10, and MHQ. The unrotated factor solution revealed 10 common factors with eigenvalues > 1 . The first factor explained 38.12% of the variance, which is below the 40% threshold, indicating no significant common method bias in this study.

Chain Mediation Analysis of Physical Activity and Psychological Resilience Between Social Isolation and Psychological Well-Being

Using the SPSS PROCESS 4.1 macro, and controlling for age, educational level, chronic health conditions, living situation, hobbies, and attitude toward community older adult care environment, social isolation was treated as the independent

variable, psychological well-being as the dependent variable, and psychological resilience and physical activity as mediator variables. Results showed that social isolation negatively predicted physical activity, psychological resilience, and psychological well-being ($b = -5.378, -0.491, -0.090$, respectively; all $p < 0.001$); physical activity positively predicted psychological resilience and psychological well-being ($b = 0.019, 0.003$, respectively; both $p < 0.001$); psychological resilience positively predicted psychological well-being ($b = 0.066, p < 0.001$); and social isolation directly predicted psychological well-being ($b = -0.090, p < 0.001$) (Table 3).

Using the bias-corrected non-parametric percentile bootstrap meth-

od in Model 6 to test the significance of mediation effects revealed that physical activity and psychological resilience mediate the relationship between social isolation and psychological well-being. The total indirect effect size is 0.054 across three mediation chains: (1) social isolation → physical activity → psychological well-being, with an effect size of 0.015; (2) social isolation → psychological resilience → psychological well-being, with an effect size of 0.033; (3) social isolation → physical activity → psychological resilience → psychological well-being, with an effect size of 0.007. The 95% bootstrap CIs for all paths do not include 0, indicating significant independent and chain mediation effects of physical activity and psychological resilience. Specific pathways are detailed in **Table 4**.

DISCUSSION

Social isolation is an important factor affecting the psychological well-being of older adults. Psychological well-being is a relatively stable cognitive and emotional experience produced by individuals through a comprehensive evaluation of their own quality of life (Pachana, 2023). Results of the current study found that social isolation directly and negatively predicted older adults' psychological well-being, indicating that the higher the degree of social isolation, the lower the psychological well-being, which is consistent with previous studies (Qi et al., 2022; Taylor et al., 2018). The current study also found that in addition to the indirect effect, the direct effect of social isolation on psychological well-being accounted for 38.89% of the total effect, suggesting that social isolation is one of the important influencing factors of psychological well-being in older adults. Social isolation may lead to psychological problems, such as depression and anxiety in older adults (Quach & Burr, 2021). In addition, lack of support and companionship from friends and relatives in socially isolated older adults may contribute

to reduced quality of life in older adults (Sayin Kasar & Karaman, 2021). The above in turn seriously affects the psychological well-being of older adults. Results of the current study suggest that community health workers can identify older adults who may have decreased psychological well-being through the measurement of social isolation. Among the tools for measuring social isolation in older adults, the UCLA Loneliness Scale (Gao et al., 2024) is one of the most commonly used. This scale has been widely applied in fields such as psychology, sociology, gerontology, and clinical assessment. In addition, the design of the UCLA Loneliness Scale is simple yet comprehensive, with clear and straightforward questions that are easy for older adults to understand. This simplicity makes it particularly popular in community work, as community workers can more easily communicate with older adults and collect data, and improve older adults' social interaction through active interventions, such as establishing interaction mechanisms, listening and showing respect, and making full use of modern communication technology, so as to improve the psychological well-being of older adults.

In the current study, the mediating model of social isolation affecting

TABLE 4
Analysis of Mediating Effect

Type	Intermediary Path	Effect Size	Boot SE	Boot 95% CI	% of Total Effect
Total effect		0.090	0.013	[0.064, 0.115]	
Total indirect effects		0.054	0.011	[0.034, 0.077]	60.00
Direct effects	Social isolation → psychological well-being	0.035	0.010	[0.015, 0.056]	38.89
Mediating effect	Social isolation → physical activity → psychological well-being	0.015	0.004	[0.008, 0.023]	16.67
	Social isolation → resilience → psychological well-being	0.033	0.009	[0.016, 0.051]	36.67
	Social isolation → physical activity → resilience → psychological well-being	0.007	0.003	[0.002, 0.013]	7.78

Note. Boot = bootstrapping; SE = standard error; CI = confidence interval.

the psychological well-being of older adults accounted for 60% of the total mediating effect of physical activity and psychological resilience, indicating that physical activity and psychological resilience are important explanatory mechanisms for the decline of psychological well-being in older adults caused by social isolation. Among the mediation model, psychological resilience was an important mediating variable, and the indirect effect was 0.033, accounting for 36.67% of the total effect, indicating that social isolation of older adults could lead to a decrease in psychological resilience and reduce psychological well-being. As individuals age, socially isolated older adults often lack a stable support system (Gable & Bedrov, 2022) and have difficulty managing negative emotions, which in turn leads to a decrease in individual self-efficacy (Gu et al., 2023). Some studies (Jing et al., 2024) have shown that this decrease in self-efficacy is an important factor in the decline of psychological resilience. Therefore, the occurrence of social isolation in older adults leads to a decrease in their psychological resilience, which in turn reduces the level of psychological well-being. In this regard, community workers should help older adults strengthen their social support, build social networks, and encourage active participation in community activities, such as interest groups, volunteer services, and community gatherings, to expand their social circles. At the same time, family members should try to spend time regularly visiting older adults and organizing family gatherings to make them feel the warmth and care of the family. In addition, modern technology can be used, such as social media and video calls, to help older adults stay connected with distant relatives and friends, alleviating their feelings of loneliness. Furthermore, psychological counseling should be provided to offer professional mental health services, helping older adults overcome loneliness and anxiety, and boosting their self-confidence and positivity. Communities can introduce professional

psychological counseling services and provide regular psychological guidance for older adults, thereby enhancing their psychological well-being.

Physical activity was also an important mediating mechanism between social isolation and psychological well-being, accounting for 16.67% of the total effect size. Studies have shown that social isolation reduces physical activity in older adults (Xue & Yang, 2023). Appropriate physical activity makes older adults energetic, enhances their interest in life, and improves their sleep conditions, thus improving their psychological well-being. In addition, older adults who experience social isolation lack the motivation to interact with others and lack social support, which leads to a decrease in physical activity, which in turn reduces their psychological well-being. Therefore, community workers should pay attention to the impact of social isolation on the physical activity of older adults. Clinical caregivers should be keen to identify older adults experiencing social isolation, which often manifests in reduced participation in social activities and decreased contact with family and friends. Organizing social physical activities that align with the interests and physical conditions of older adults is essential. Activities such as square dancing, tai chi, or walking groups can be organized, which not only increase physical activity but also promote social interaction. In addition, personalized exercise recommendations should be provided based on the physical condition and exercise preferences of older adults. For example, for those with mobility issues, light indoor exercises, such as yoga or breathing exercises, can be recommended.

Social interaction can also improve mental resilience by increasing physical activity, which can lead to improved psychological well-being. Results of the current study showed that physical activity and mental resilience were both mediating variables, and their relative effects accounted for 7.78%. Social isolation can negatively

impact an individual's mental health, resulting in low mood and even depression (Mei, 2021).

Individuals with high resilience are more likely to adopt positive coping strategies when faced with social isolation, and recover from social isolation more easily, thereby improving their psychological well-being (Pachana, 2023). Although social isolation can have many negative effects, participating in activities can improve one's psychological well-being. Studies have shown that regular exercise can release positive chemicals, such as endorphins, reduce stress, and improve mood (Pesce et al., 2015). For older adults experiencing social isolation, physical activity not only builds new social connections, but also alleviates loneliness through the positive experience that comes with activity. Therefore, people who are socially isolated can still improve their well-being and overcome the negative effects of isolation through physical activity. Clinical nurses should encourage older adults to engage in moderate physical activities, enhance their psychological resilience, facilitate social interactions, and develop personalized care plans to comprehensively improve their psychological well-being.

LIMITATIONS

The current study is cross-sectional and cannot explore whether there is a causal relationship between social isolation, physical activity, resilience, and psychological well-being in older adults. In addition, because the study sample was mainly concentrated in some communities in northern China, older adults in rural areas and other areas were not included. Future research can further expand the research population, and longitudinal studies can be used to further clarify the relationship between social isolation and psychological well-being of community-dwelling older adults in China, and provide strategies for improving the psychological well-being of older adults.

CONCLUSION

Physical activity and resilience have a chain mediating effect between social isolation and psychological well-being. The equation model was used to investigate the individual and continuous mediating effects of physical activity and psychological resilience at the same time, and the level of physical activity and psychological resilience in the psychological well-being of older adults was verified. Based on the chain of multiple mediating relationships, this study provides a new perspective for considering the mediating mechanism of social isolation in older adults.

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