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The Relationship Between Physical Activity and Health Status Among Senior University Students in Sichuan, China

Cheng Yuwen [1] **and Pornteap Leethong-In**[2]
Bangkokthonburi University, Thailand
E-mail: mztkn008@qq.com, ORCID ID: https://orcid.org/0000-0001-8456-1646
E-mail: leethongin@hotmail.com, ORCID ID: https://orcid.org/0000-0002-2691-3727

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Abstract

Background and Aim: Physical activity plays a crucial role in maintaining overall health by reducing the risk of chronic diseases like heart disease, diabetes, and obesity. Regular exercise also improves mental well-being, boosts immunity, and enhances overall quality of life. This study examines the relationship between physical activity levels and health status among older adults attending a senior university in Mianyang, Sichuan Province, China. With China's aging population increasing, understanding the impact of physical activity on health is crucial for improving the quality of life among the elderly.

Materials and Methods: A cross-sectional study was conducted on 282 participants aged 60 and above, using stratified random sampling. Data were collected via a structured questionnaire covering demographics, physical activity levels, and health status. Validity (0.85) and reliability (0.88) were ensured. Statistical analysis included descriptive statistics, multiple regression, and Pearson correlation.

Results: Most participants were male (46.81%), aged 61-70 years (46.81%), married (46.10%), and had primary education (73.76%). Moderate-to-high levels of physical activity significantly improved physical, mental, social, and spiritual health. A positive correlation was found among different health dimensions, highlighting the interrelated nature of health.

Conclusion: This study examines the relationship between physical activity levels and health outcomes in older adults. The results show that moderate and vigorous physical activity has a significant positive impact on physical, mental, social, and psychological health. Specifically, compared to inactive participants, those engaging in moderate or vigorous physical activity experience significant reductions in physical frailty, psychological decline, and social health deterioration. Ordered multinomial logistic regression analysis reveals that both vigorous physical activity (PhyA=1) and moderate physical activity (PhyA=2) have negative regression coefficients for all health statuses with significant p-values, indicating a positive effect on health outcomes. In terms of correlations, physical health, mental health, social health, and psychological health are significantly positively correlated, with correlation coefficients of 0.657 between physical and mental health, 0.606 between physical and social health, and 0.588 between physical and psychological health. However, these correlations vary by activity level. At inactive levels, no significant correlations were found between health statuses. At moderate intensity levels, a significant positive correlation between mental and social health was observed, while at vigorous activity levels, no significant correlations between health statuses were found. Additionally, the study examines how various factors such as gender, age, marital status, education, occupation, income, BMI, caregiver status, and participation in senior clubs relate to physical activity levels. The results show that retirees (59.93%) engage more in vigorous physical activity, while farmers (a higher proportion) participate more in moderate-intensity physical activity.

Keywords: Physical Activity; Health Status; Elderly Population

Introduction

China is currently confronting the challenge of an aging population (Wang, 2022). According to the National Health Commission, by the "14th Five-Year Plan" period (2021-2025), the number of elderly individuals aged 60 and above is expected to exceed 300 million, accounting for over 20% of the total population, indicating a transition into a moderately aged society. By around 2035, the elderly population is projected to surpass 400 million, representing more than 30% of the total population, marking a shift into a severely aged society. As of the end of 2021, there were 267 million people aged 60 and above, constituting 18.9% of the total population, and over 200 million people aged 65 and above, making up 14.2% of the total population. The National Health Commission has stated its commitment to implementing a national strategy for actively responding to population aging, promoting healthy aging, and exploring a path characteristic of China's approach to addressing population aging. In response to the challenges posed

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by China's aging population, the "Healthy China 2030" Planning Outline has been officially introduced (Central Committee of the Communist Party of China & State Council, 2016). This comprehensive strategy aims to enhance the health and well-being of the population, improve the healthcare system, and ensure sustainable development in the face of demographic shifts. The Healthy China 2030 Strategy puts forward the concept of people's health-centered development and proposes a series of important measures, including strengthening basic medical and health services, promoting health promotion and disease prevention, and improving the medical security system.

In existing research, many scholars typically focus on certain functional indicators to measure the health status of older adults, concentrating more on physiological health. These studies often overlook other potential health issues, such as depression, even when functional indicators are normal. People are increasingly concerned about health, and more and more people are engaging in health research. However, health research is complex because it encompasses various physiological indicators and psychological aspects, making it difficult to comprehensively assess health status. Therefore, many experts have begun using self-rated health to evaluate health. Self-rated health (SRH) is a commonly used indicator in health and social research, strongly associated with mortality across different populations and considered a comprehensive reflection of health status that may exceed clinical diagnoses (Kananen et al., 2021; Ibsen et al., 2024). Research indicates that SRH is related to various biomarkers representing multiple biological domains of the human body, including inflammation, lipid and glucose metabolism, oxidative stress, and tissue damage (Kananen et al., 2021). In rural elderly disabled populations in China, Self-rated health has revealed multiple factors affecting their health status, including age, education level, chronic disease conditions, pain, depression, and social activity participation (Fang Hui et al., 2023). These studies highlight the value of Self-rated health as a comprehensive health indicator and suggest potential ways to improve SRH through lifestyle improvements and social support. Despite Self-rated health being a powerful predictive tool, it does not establish causality, necessitating further multidisciplinary research to explore its connections with the biological state of the human body (Ibsen et al., 2024; Kananen et al., 2021). Fessler et al. (2023) further emphasized the protective role of physical activity in individuals with multimorbidity. Using data from the Survey of Health, Ageing and Retirement in Europe (SHARE), the study found that physical activity was positively associated with better physical, cognitive, psychological, and overall health indicators, whereas multimorbidity was negatively associated with these health indicators. Notably, the positive association between physical activity and health indicators was more significant in individuals with multimorbidity, highlighting the importance of physical activity in this population. Yamada et al. (2020) conducted a systematic review and network meta-analysis to provide evidence on the impact of physical activity on the physical function of older adults residing in care facilities. Compared to usual care, physical interventions were associated with significant improvements in overall physical function, particularly when exercising for 110 to 225 minutes per week.

Although there is an increasing number of articles using self-rated health indicators to study the health of older adults, these studies often narrow the scope of physical activity and do not comprehensively cover the common physical activities of older adults. Additionally, some studies might choose to use comprehensive scales such as PASE (Physical Activity Scale for the Elderly), but in some cases, this does not align well with the current physical activity situations of older adults in China. For example, older Chinese people generally do not engage in activities like lawn mowing. To address these gaps in existing research, this study plans to investigate the relationship between physical activity and health in older adults by examining nine types of physical activities common among older adults in China, using self-rated health as an indicator. It aims to explore the current state of physical activity among older adults with different health statuses, the connections between different types of physical activities and health, and identify which types of physical activities can promote health. By doing so, this study aims to gain a more comprehensive understanding of the health effects of various types of physical activities on older adults in China, thereby filling the current research gap in this area. This approach will not only help in thoroughly assessing the

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health status of older adults but also provide more accurate and targeted recommendations for improving the health of older adults.

Objectives

To study the relationship between physical activity and the health of the elderly at a Senior University in Mianyang, Sichuan, China.

Literature review

Definition of Elderly

When addressing global health concerns and challenges related to aging, the World Health Organization (WHO) delineates individuals aged 60 and above as elderly (WHO, 2020). Similarly, the United Nations adopts this threshold in certain reports to classify elderly individuals. Notably, in many developing nations where life expectancy is comparatively shorter, the age of 60 marks the onset of old age. This perspective is reinforced by China's statutory retirement age for males, set at 60, which further shapes our understanding and identification of elderly individuals in various contexts. In developed countries such as the United States, Canada, and European nations, the widely accepted starting age for seniors is 65. This definition is closely tied to the retirement systems and social security frameworks of these countries. The International Labour Organization (ILO) typically recommends a retirement age of 65, which has significant implications for international standards and policies. Regarding pensions and social security, 60 is often the age at which full retirement benefits are received in China, making it a crucial threshold in many national social security systems. Additionally, in demographic studies, individuals aged 60 and above are commonly classified as "elderly" or "older adults," further solidifying the recognition of 60 as the starting age for seniors.

Since the region we are studying belongs to China, a developing country, the age definition of the elderly differs from that of developed nations. In Southwest China, it is commonly accepted to consider individuals aged 60 and above as elderly. This delineation reflects the social, cultural, and policy context of the country, as well as its retirement system and related policies. Therefore, in our study, we will use the age of 65 as the criterion for defining the elderly.

Definition of physical activity

Physical activity is broadly defined by Britannica as "any form of bodily movement that is produced by the contraction of skeletal muscle and therefore results in energy expenditure". This definition encapsulates a wide array of activities, from structured exercises to everyday tasks such as household chores and work-related activities. The American College of Sports Medicine (ACSM) and the U.S. Department of Health and Human Services (HHS) have provided comprehensive definitions of physical activity in their respective guidelines. The ACSM defines physical activity as "any bodily movement produced by skeletal muscles that results in energy expenditure" above resting levels, emphasizing the role of intentional physical activity in improving health and fitness (American College of Sports Medicine, 2011). This definition encapsulates a broad range of activities, from structured exercise to everyday movements, that contribute to enhancing physical capabilities. Conversely, the HHS presents a definition that focuses on the health benefits derived from physical activity, describing it as "any bodily movement produced by the contraction of skeletal muscle that increases energy expenditure above a basal level" (U.S. Department of Health and Human Services, 2008). The HHS guidelines are designed to encourage regular physical activity as a means to prevent chronic diseases and promote overall well-being. Both sources recognize the importance of physical activity in maintaining health, but they approach the subject from slightly different perspectives, with the ACSM focusing on fitness and the HHS on general health and disease prevention. The World Health Organization (WHO) describes physical activity as encompassing "any bodily movement produced by skeletal muscles that requires energy expenditure," including movements during leisure, transportation, work, or domestic activities (World Health Organization, 2024).

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The studies indicate that definitions of physical activity vary among scholars, often classified from the perspective of energy expenditure resulting from the contraction of skeletal muscles. Different activities, even when performed by the same individual, can have distinct effects on physical fitness and health based on their inherent energy expenditure and engagement level. The World Health Organization (WHO) has developed the Global Physical Activity Questionnaire (GPAQ) to assess physical activity levels across different domains, including work, transportation, and leisure. The GPAQ categorizes leisure-time physical activity into moderate and vigorous intensities, providing a standardized method for global research. This classification is widely used in studies to evaluate the impact of physical activity on health outcomes, emphasizing the importance of both intensity and context in understanding active lifestyles (WHO, 2020).

Physical activity for adults aged 60 years and above

In recent years, the engagement of older adults in physical activity has gained significant attention due to the escalating aging population globally. Physical activity is a pivotal component for maintaining the health and well-being of adults aged 60 years. The current state of physical activity among this demographic, as illuminated by recent research, presents a complex landscape. The study by Chen et al. (2022) delves into the social activity patterns of elderly individuals in China who are suffering from chronic diseases, revealing that a significant proportion of the elderly population exhibits low levels of social and, by extension, physical activity. The research underscores that 70.2% of the elderly participants were identified as having low social activity levels, which is indicative of a broader trend of sedentariness in this age group. This lack of activity is further exacerbated by increasing age, with older individuals showing even lower rates of engagement. Complementing this, the research progress reported by Yao et al. (2022) on the physical activity status and influencing factors of the elderly in nursing homes paints a similar picture. The review highlights that the elderly in institutional care often lead sedentary lifestyles, with limited participation in organized activities and a general preference for sitting or lying down throughout the day. This trend is not only prevalent in Chinese nursing homes but also observed in facilities abroad, suggesting that the issue is a global concern within geriatric care. The analytical review by Macera et al. (2017) provides a comprehensive overview of the importance of physical activity for older adults, emphasizing the updated Physical Activity Guidelines of 2008. The review identifies three key dimensions of physical activity for this age group: increasing aerobic activity, enhancing muscle-strengthening activity, and notably, reducing sedentary behavior. The study acknowledges the challenges faced by older adults, such as chronic diseases and mobility issues, and suggests that despite these barriers, engaging in physical activity can yield substantial health benefits, including disease prevention and improved cognitive function.

In synthesizing these studies, it is evident that while the benefits of physical activity for adults aged 60 and above are well recognized, the actual engagement levels remain suboptimal. The existing literature suggests that there is a pressing need for interventions that consider the unique challenges faced by this demographic, such as chronic health conditions, social isolation, and the fear of falling or injury.

Conceptual Framework

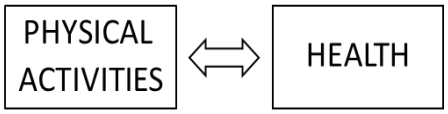

Figure 1 Conceptual Framework

Methodology

Research Design

This study employs a cross-sectional analytical study design and utilizes multiple regression analysis to examine the relationship between physical activity levels and health status among older adults attending

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a senior university in Mianyang, Sichuan Province, China. Data were collected through face-to-face interviews using structured questionnaires.

Population

Older adults attending a senior university in Mianyang, Sichuan, China.

Sample Size

The required sample size was calculated using W.G. Cochran's formula, resulting in 322 participants. To account for potential non-responses and incomplete data, an additional 30 questionnaires were collected, bringing the total sample size to 330. The final effective response rate was 85.45%, with 282 valid questionnaires returned.

Sampling Method

Stratified random sampling was used, with stratification based on key demographic variables such as age, gender, and socioeconomic status to ensure representativeness.

Data Collection

Method: Data were collected through face-to-face interviews to ensure high response rates and data accuracy.

Timing and Location: Interviews were conducted during breaks or after classes at the senior university to minimize disruption to participants' schedules.

Quality Control: Immediate checks were performed on the questionnaires to ensure completeness and accuracy. Follow-up interviews were conducted for incomplete questionnaires.

Research Instrument

Questionnaire Design: The questionnaire consisted of three sections: Personal Data Questionnaire, Physical Activity Questionnaire, and Health Status Questionnaire.

Validity and Reliability Assessment: The questionnaire's validity was assessed by a panel of five experts, resulting in a validity coefficient of 0.85. The reliability analysis of the data from the questionnaire shows that the Alpha reliability is 0.888, which shows that the results of the questionnaire are reliable and consistent.

Cultural and Linguistic Adaptation: The questionnaire was designed with consideration of the language and cultural background of the target population to ensure ease of understanding.

Results

The primary objective of this study was to examine the relationship between physical activity levels and health status. The results, derived from multinomial logistic regression and correlation analysis, revealed that both vigorous and moderate-intensity physical activities significantly promote physical, mental, social, and psychological health. Moreover, physical activity was found to have a positive interrelationship with various health dimensions, suggesting that improvements in one area often contribute to benefits in others. Additionally, demographic factors such as age, gender, marital status, and education level were found to significantly affect physical activity participation patterns. However, limitations such as the reliance on self-reported data and regional biases must be considered when interpreting these results.

Descriptive statistics

Table 1 shows general information on factors related to physical activity.

No	Issues	Inactive		Moderate		Vigorous		Total	
		N	%	N	%	N	%	N	%
1.1	Gender:								
	1)Male	49	44.95	32	45.71	51	49.51	132	46.81
	2)Female	60	55.05	38	54.29	52	50.49	150	53.19
1.2	Age:								
	1) 61-70	55	50.46	38	54.29	39	37.86	132	46.81
	2) 71-80	34	31.19	17	24.29	43	41.75	94	33.33

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No	Issues	Inactive		Moderate		Vigorous		Total	
		N	%	N	%	N	%	N	%
	3) over 81 years old	20	18.35	15	21.43	21	20.39	56	19.86
1.3	Status:								
	1) Single	28	25.69	17	24.29	24	23.30	69	24.47
	2) Married	43	39.45	33	47.14	54	52.43	130	46.10
	3) Widowed, Separated	38	34.86	20	28.57	25	24.27	83	29.43
1.4	Education:								
	1) No formal education	21	19.27	16	22.86	24	23.30	61	21.63
	2) Primary Education	85	77.98	53	75.71	70	67.96	208	73.76
	3) Secondary education	1	0.92	1	1.43	5	4.85	7	2.48
	4) Bachelor's degree	1	0.92	0	0.00	4	3.88	5	1.77
	5) Other (please specify)	1	0.92	0	0.00	0	0.00	1	0.35
1.5	Occupation:								
	1) Farmer	20	18.35	13	18.57	29	28.16	62	21.99
	2) Freelancers	17	15.60	10	14.29	8	7.77	35	12.41
	3) Manual workers	3	2.75	6	8.57	6	5.83	15	5.32
	4) Retirement	68	62.39	41	58.57	60	58.25	169	59.93
	5) Other (please specify)	1	0.92	0	0.00	0	0.00	1	0.35
1.6	Income								
	1) Sufficient for expenses	49	44.95	31	44.29	50	48.54	130	46.10
	2) Insufficient for expenses, but no debt	38	34.86	21	30.00	28	27.18	87	30.85
	3) Insufficient for expenses and in debt	9	8.26	8	11.43	12	11.65	29	10.28
	4) More than enough, with savings	13	11.93	10	14.29	13	12.62	36	12.77
1.7	IBM (kg. /H^2)								
	1) <18.50 kg. /H^2	21	19.27	14	20.00	17	16.50	52	18.44
	2) 18.50-22.99 kg. /H^2	39	35.78	31	44.29	45	43.69	115	40.78
	3) >23.00 kg. /H^2	49	44.95	25	35.71	41	39.81	115	40.78
1.8	Caregiver								
	1) Yes, I have a caregiver	44	40.37	27	38.57	32	31.07	103	36.52
	2) No, I do not have a caregiver	65	59.63	43	61.43	71	68.93	179	63.48
1.9	Senior citizens' club								
	1) Yes, I am a member and participate regularly (8–12 times per year).	34	31.19	22	31.43	33	32.04	89	31.56
	2) No, I am not a member, or I am a member but participate irregularly (less than 8–12 times per year)	75	68.81	48	68.57	70	67.96	193	68.44

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The table presents demographic and occupational data on physical activity participation. Females (53.19%) slightly outnumber males, with more females in the inactive group (55.05%). Most participants are aged 61-70 years (46.81%), and the highest proportion of vigorous activity participants is aged 71-80 years (41.75%). Married individuals (46.10%) are most common in the vigorous activity group (52.43%). Most participants have secondary education (73.76%), with higher proportions in moderate and vigorous activity groups. Additionally, 59.93% are retired, and 46.10% report sufficient income. Participants with a BMI of 18.50-22.99 kg/m² make up 40.78%. Married, younger, and more educated individuals are more likely to engage in physical activity.

Table 2 Results of ordered multiple regression analysis of physical activity and physical health.

Parameter estimation value					
		E	**std Error**	**Wald**	**P**
Threshold	[PhyH = 1]	-7.943	1.133	49.134	0
	[PhyH = 2]	-5.325	1.07	24.763	0
	[PhyH = 3]	-3.351	1.024	10.718	0.001
	[PhyH = 4]	-1.679	0.999	2.829	0.093
variables	MenH	0.009	0.136	0.004	0.948
	SocH	-0.121	0.132	0.846	0.358
	SpiH	-0.021	0.14	0.023	0.879
	Gender	-0.317	0.235	1.818	0.178
	[PhyA=1]	-7.301	0.723	101.972	0.000***
	[PhyA=2]	-2.519	0.363	48.135	0.000***
	[PhyA=3]	0a	.	.	.

*P<0.1 **P<0.05 ***P<0.01 R2=0.691

The study employed multiple regression analysis to examine the impact of different physical activity levels on physical health. Results indicated that both vigorous physical activity (coefficient = -7.301, P = 0.000) and moderate physical activity (coefficient = -2.519, P = 0.000) significantly reduce physical weakness, demonstrating their positive effects on physical health. In contrast, mental health, social health, spiritual health, and gender did not significantly impact physical health, with P-values greater than 0.1. The model's R^2 value of 0.691 suggests that it explains 69.1% of the variance in physical health status, indicating a good fit. These findings emphasize the importance of physical activity in enhancing physical health and support public health strategies to promote active lifestyles. They also provide a foundation for personalized health recommendations, especially for those at higher risk of physical weakness.

Table 3 Results of multiple regression analysis of physical activity and mental health.

Parameter estimation value					
		E	**std Error**	**Wald**	**P**
Threshold	[MenH = 1]	-4.304	1.139	14.282	0
	[MenH = 2]	-2.864	1.127	6.463	0.011
	[MenH = 3]	-1.118	1.108	1.018	0.313
	[MenH = 4]	1.426	1.105	1.665	0.197
variables	SocH	0.022	0.125	0.031	0.86
	SpiH	0.208	0.133	2.44	0.118
	Gender	-0.107	0.225	0.227	0.633

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Parameter estimation value					
		E	**std Error**	**Wald**	**P**
	PhyH	-0.031	0.149	0.044	0.833
	[PhyA=1]	-4.206	0.691	37.017	0.000***
	[PhyA=2]	-1.447	0.368	15.494	0.000***
	[PhyA=3]	0a	.	.	.

*P<0.1 **P<0.05 ***P<0.01 R2=0.530

The multiple regression analysis results show that both vigorous (coefficient = -4.206, P = 0.000) and moderate physical activity (coefficient = -1.447, P = 0.000) significantly improve mental health. In contrast, social health, spiritual health, gender, and physical health did not significantly impact mental health. The model's R^2 value of 0.53 indicates it explains 53% of the variance in mental health, suggesting a good fit. While the impact of physical activity on mental health is slightly weaker than on physical health (R^2 = 0.691), it remains a significant factor in mental well-being.

Table 4 Results of ordered multiple regression analysis of physical activity and social health.

Parameter estimation value					
		E	**std Error**	**Wald**	**P**
Threshold	[SocH = 1]	-5.002	1.121	19.909	0
	[SocH = 2]	-3.41	1.104	9.542	0.002
	[SocH = 3]	-1.274	1.078	1.398	0.237
	[SocH = 4]	0.276	1.073	0.066	0.797
variables	SpiH	0.103	0.131	0.616	0.433
	Gender	0.009	0.221	0.002	0.966
	PhyH	-0.171	0.147	1.368	0.242
	MenH	0.021	0.13	0.026	0.872
	[PhyA=1]	-4.604	0.681	45.76	0.000***
	[PhyA=2]	-1.355	0.348	15.192	0.000***
	[PhyA=3]	0a	.	.	.

*P<0.1 **P<0.05 ***P<0.01 R2=0.508

The ordered multiple regression analysis reveals that both vigorous (coefficient = -4.604, P = 0.000) and moderate physical activity (coefficient = -1.355, P = 0.000) significantly improve social health. In contrast, spiritual health, gender, physical health, and mental health did not significantly impact social health. The model's R^2 value of 0.508 indicates that it explains 50.8% of the variance in social health, showing a good fit. While the impact of physical activity on social health is slightly weaker than on physical (R^2 = 0.691) and mental health (R^2 = 0.53), it remains significant.

Table 5 Results of ordered multiple regression analysis of physical activity and spiritual health.

Parameter estimation value					
		E	**std Error**	**Wald**	**P**
Threshold	[SpiH = 1]	-3.782	1.142	10.973	0.001
	[SpiH = 2]	-2.092	1.129	3.434	0.064
	[SpiH = 3]	0.407	1.109	0.135	0.714

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		Parameter estimation value			
variables	[SpiH = 4]	2.232	1.118	3.981	0.046
	PhyH	-0.03	0.146	0.041	0.839
	MenH	0.176	0.13	1.837	0.175
	SocH	0.119	0.123	0.932	0.334
	Gender	0.013	0.222	0.004	0.952
	[PhyA=1]	-3.367	0.694	23.524	0.000***
	[PhyA=2]	-0.705	0.349	4.085	0.043**
	[PhyA=3]	0a	.	.	.

*P<0.1 **P<0.05 ***P<0.01 R^2=0.459

This study analyzes the impact of physical activity on four health dimensions: physical, mental, social, and spiritual. The results indicate that both vigorous (PhyA=1) and moderate (PhyA=2) physical activity significantly improve spiritual health, with vigorous activity having a stronger effect (coefficient -3.367 for vigorous, coefficient -0.705 for moderate). Vigorous physical activity is most beneficial for physical health (coefficient -7.301), followed by mental health (coefficient -4.206) and social health (coefficient -4.604), with a weaker effect on spiritual health (coefficient -3.367). Moderate activity also positively impacts all health dimensions, though to a lesser degree. Physical activity explains physical (R^2=0.691), mental (R^2=0.53), and social health (R^2=0.508) more strongly than spiritual health (R^2=0.459). Overall, moderate-to-vigorous physical activity is a key factor in improving overall health, particularly physical health.

Table 6 Correlation results between various health states with complete data.

	Physical Health	Mental Health	Social Health	Spiritual Health
Physical Health	1	0.657***	0.606***	0.588***
Mental Health	0.657***	1	0.559***	0.561***
Social Health	0.606***	0.559***	1	0.532***
Spiritual Health	0.588***	0.561***	0.532***	1

*P<0.1 **P<0.05 ***P<0.01

From Table 4.6, we can find that the correlation coefficients of physical health with mental health, social health, and spiritual health are 0.657, 0.606, and 0.588, respectively, and the P values are all less than 0.01, indicating that physical health and the other three health states are significantly positively correlated, and physical health and other health states have a mutually reinforcing effect. The correlation coefficients of mental health with social health and spiritual health are 0.559 and 0.561, respectively, and the P values are all less than 0.01, indicating that mental health is significantly positively correlated with the other two health states, and mental health can promote the improvement of the other health. Social health and spiritual health also maintain a significant positive correlation with a p-value less than 0.01 and a coefficient of 0.532, indicating that maintaining social health will also improve people's mental health.

Table 7 Correlation results between various health states in the case of inactive physical activity.

	Physical Health	Mental Health	Social Health	Spiritual Health
Physical Health	1	0.003	0.027	0.012
Mental Health	0.003	1	-0.112	-0.006
Social Health	0.027	-0.112	1	-0.059
Spiritual Health	0.012	-0.006	-0.059	1

*P<0.1 **P<0.05 ***P<0.01

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It can be found from Table 4.7 that under inactive physical activity, there is no significant correlation between the four health outcomes, indicating that when people maintain inactive physical activity, there is no significant connection between physical health, mental health, social health, and spiritual health.

Table 8 Correlation results between various health states under moderate physical activity conditions.

	Physical Health	Mental Health	Social Health	Spiritual Health
Physical Health	1	0.149	-0.089	0.051
Mental Health	0.149	1	0.277*	0.087
Social Health	-0.089	0.277*	1	0.270*
Spiritual Health	0.051	0.087	0.270*	1

*P<0.1 **P<0.05 ***P<0.01

From Table 4.8, we can find that under moderate physical activity, the correlation coefficient between mental health and social health is 0.277, which is a significant positive correlation, indicating that when people maintain moderate physical activity, mental health and social health will promote each other. The correlation coefficient between social health and mental health is 0.270, which is a significant positive correlation, indicating that when people maintain moderate activities, the improvement of social health will also lead to the improvement of mental health.

Table 9 Correlation results between various health states under vigorous physical activity conditions.

	Physical Health	Mental Health	Social Health	Spiritual Health
Physical Health	1	-0.103	-0.183	-0.091
Mental Health	-0.103	1	-0.099	0.134
Social Health	-0.183	-0.099	1	0.013
Spiritual Health	-0.091	0.134	0.013	1

*P<0.1 **P<0.05 ***P<0.01

It can be found from Table 4.11 that under vigorous physical activity, there is no significant correlation between the four types of health, indicating that when people maintain active physical activities, there is no significant connection and interaction between physical health, mental health, social health, and spiritual health.

Conclusion

The study examines factors related to physical activity and its impact on health. The majority of participants were male (46.81%), aged 61-70 (46.81%), married (46.10%), and had primary education (73.76%). Most were retired (59.93%) and had sufficient income (46.10%). Increased physical activity, including moderate and vigorous levels, positively affects physical, mental, social, and psychological health. Vigorous and moderate activity show negative regression coefficients for all health statuses, indicating significant health benefits. Correlations between health statuses were found, with stronger relationships at moderate activity levels. Retirees and farmers were more likely to engage in vigorous and moderate physical activity, respectively. The importance of the above findings lies in their potential to guide public health initiatives and interventions aimed at improving the health and well-being of the elderly. By identifying key demographic factors and activity levels that influence health outcomes, policymakers and healthcare providers can develop targeted programs to promote physical activity among older adults, especially those who are retired or have limited education. This can help reduce frailty, enhance mental and social well-being, and ultimately improve the overall quality of life for aging populations.

Discussion

This study explored the relationship between physical activity levels and health status, revealing several key findings. Vigorous and moderate-intensity physical activities significantly promote physical, mental, social, and psychological health, possibly through physiological improvements like enhanced cardiovascular function and neurotransmitter release. Research supports this, with studies by Dupré et al. (2023) and Tanaka et al. (2020) highlighting the benefits of both moderate and vigorous activity for health outcomes and mortality reduction. Additionally, the study found significant positive correlations between

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physical, mental, social, and psychological health, suggesting that these health statuses mutually reinforce each other, as supported by Mathentamo et al. (2024).

At different physical activity levels, health status correlations varied. While no significant correlations were found at an inactive level, moderate-intensity physical activity showed a positive correlation between mental and social health, aligning with findings from Arab et al. (2021) and Burton & Turrell (2005), who noted that moderate activity promotes social participation and cognitive health. The study also highlighted demographic factors, with retirees more likely to engage in vigorous activity and farmers in moderate activity. This finding aligns with Qobadi & Payton (2017) and Arazi et al. (2022), who showed that gender, age, and education influence physical activity levels.

Despite these insights, the study had limitations, such as a sample primarily focused on the elderly, which may limit generalizability. The use of self-reported data may also introduce bias, and future research could benefit from objective measures like wearable devices. Moreover, the study's cross-sectional design cannot establish causality, and future research should employ experimental or longitudinal studies to better understand the cause-and-effect relationship between physical activity and health outcomes. Expanding the scope to include more health dimensions, such as environmental or occupational health, and considering social and environmental factors like access to safe exercise spaces, could enhance future studies' applicability and depth.

Recommendation

Future research should focus on a broader range of populations, including different age groups, genders, cultural backgrounds, and occupational groups, to enhance the generalizability of findings. Cross-cultural studies should explore how physical activity affects health in various cultural contexts. Objective measurement tools, such as wearable devices, should be prioritized to minimize subjective reporting biases and improve the accuracy of data. Causal relationships between physical activity and health status should be further explored through randomized controlled trials (RCTs) and longitudinal studies to clarify specific mechanisms. Future research should also incorporate additional health dimensions, such as environmental and occupational health, to provide a more comprehensive understanding of the impact of physical activity on overall health. Long-term effects, particularly in preventing chronic diseases and improving quality of life, should be examined. Practically, promoting moderate-to-vigorous physical activity through public health initiatives, improving sports facilities, and offering community health programs will encourage greater participation. Special interventions should be developed for vulnerable groups such as the elderly and low-income populations to facilitate their engagement in physical activity and improve their health and quality of life.

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