Impact of Physical Activity Participation on Social Participation and Life Satisfaction in Elderly People with Sarcopenia and its Psychological Adaptation Mechanism

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Abstract: This article studied the benefits of participating in physical activities for the elderly with sarcopenia, especially in terms of enhancing their sense of social participation, life satisfaction and psychological adaptation. This study not only has important theoretical significance for improving the overall health level of the elderly and promoting social integration, but also provides an empirical basis for the formulation of effective health intervention policies for the elderly. Through the screening test for myopenia for the elderly over the age of 65 in urban area A as the subject of the survey, 60 patients were selected for the study, and they were randomly divided into experimental groups and reference groups. After many weeks of physical activity intervention, the experimental group used tools such as skeletal muscle mass index, self-test health assessment scale, and elderly depression scale for quantitative analysis. The collected data is processed and analyzed through statistical software, and descriptive statistical analysis is used to describe the basic characteristics of the sample. In addition, this study also uses advanced statistical methods such as structural equation models to further reveal the complex relationships between variables. The experimental results show that physical activity significantly improves the sense of social participation of the elderly with myotonia, especially in terms of personal recreational activities and outdoor autonomous participation ($P<0.01$), both of which have very significant differences. The scores of the elderly in the experimental group on the comprehensive quality of life scale significantly improved after the experiment, especially in terms of psychological function and material life ($P<0.01$), with significant differences compared to the reference group. Physical activities also promoted the psychological adaptation mechanism of the elderly, helping them actively cope with life challenges and effectively reducing depressive emotions. The analysis through the Geriatric Depression Scale revealed a significant difference between the experimental and reference groups after the physical activity intervention ($P<0.05$). Therefore, elderly people with muscular dystrophy should be encouraged and supported to actively participate in physical activities to comprehensively improve their physical and mental health and quality of life.

Keywords: Elder People with Sarcopenia, Physical Activity, Social Participation, Life Satisfaction, Psychological Adaptation Mechanisms.

Introduction

In the context of profound changes in the global demographic structure, the problem of population aging is becoming more and more prominent. With the continuous progress of medical technology, people's quality of life has been improved and their average life expectancy has been significantly extended. However, this has also brought a series of health problems related to age, among which myopenia has gradually become the focus of public attention. Myopenia is a syndrome mainly manifested as reduced skeletal muscle mass, decreased muscle strength and decreased function. It has a serious impact on the daily mobility and quality of life of the elderly, and it also increases the risk of falls and fractures. Therefore, exploring effective interventions to delay the progress of myopenia and improve the quality of life of the elderly has become an important task that needs to be solved urgently in the field of public health. The aging of the population is accompanied by the natural decline of physiological functions, especially significant changes in the muscle system. Age leads to a decrease in the number of muscle fibers, a decrease in quality, and a decrease in strength. These factors together contribute to the occurrence of myopenia. Muscular atrophy not only restricts the mobility of the elderly, but also further exacerbates their marginalization in society and reduces their sense of social participation and life satisfaction (Li et al., 2022).As a key indicator to measure the mental health and social integration of the elderly, the level of social participation has a direct impact on the quality of life and well-being of the elderly. Therefore, how to take effective interventions to enhance the sense of social participation and life satisfaction of the elderly with myopenia has become an urgent topic in geriatric medical research.

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Physical activity has been regarded as an important non-drug intervention method, which has preventive and therapeutic effects on a variety of chronic diseases (Ciria et al., 2023). Especially in the elderly population with myopenia, its role is particularly prominent. It can not only enhance muscle function, but also have a positive impact on the psychological state, thereby improving the social participation and life satisfaction of the elderly. However, for this particular group of people, the relevant research is not in-depth enough, especially how physical activity specifically affects their social and psychological state, and what the mechanism behind this is, needs to be further explored. Although existing studies have pointed out the benefits of physical activity in the physical and mental health of the elderly, the detailed path of action for the elderly with myopenia is not clear. Especially at the psychological level, how physical activities can improve their sense of social participation and life satisfaction by adjusting emotions, improving cognitive abilities, and promoting social interaction, the psychological mechanism in this process has yet to be revealed (Bilski et al., 2022). In view of this, this study will focus on how physical activity can potentially improve the social participation and life satisfaction of the elderly with myotonia and delve into the psychological adaptation mechanism. It is hoped that through a comprehensive analysis of the multi-dimensional impact of physical activity on this particular population, it will provide strong theoretical support and practical suggestions for the formulation of elderly health strategies.

The specific objectives of this study include: (1) To explore how physical activity affects the sense of social participation of the elderly with myotonia, including the frequency, depth and enthusiasm of participation; (2) To analyze the effect of physical activity on the improvement of life satisfaction of the elderly with myotonia, especially from the perspective of mental health, quality of life and well-being; (3) To reveal the psychological adaptation mechanism involved in the process of enhancing the sense of social participation and life satisfaction of the elderly with myotonia. In summary, for the elderly with myopenia, an in-depth analysis of the impact of their participation in physical activities is of great value to the formulation of effective elderly health promotion strategies. After the elderly with myotonia actively participate in physical activities, their sense of social participation and life satisfaction have been significantly improved. This discovery has brought a new perspective to the study of psychological adaptation mechanisms. The research results show that while targeted physical exercise enhances the muscle mass and function of the elderly, it also effectively promotes their better integration into the community and improves their sense of social belonging and enthusiasm for participation. These changes have further improved the quality of life and satisfaction of the elderly with myopenia and helped them face the challenges in life more calmly. At the psychological level, exercise not only optimizes the mental state of the elderly and reduces depression, but also achieves an overall improvement in physical and mental health by releasing beneficial hormones such as endorphins.

This study first outlines the research background and research significance; then, through a systematic literature review, the association between physical activity and health, social participation and life satisfaction of the elderly population is thoroughly combed, and the current research status of this field and its shortcomings are clarified. On this basis, an empirical study on the elderly population with muscular dystrophy was carefully designed and implemented. Through scientific data collection and analysis methods, the specific effectiveness of physical activity in improving the health of this special group has been comprehensively verified. Further, it discusses in depth how physical activities can have a positive impact on the sense of social participation and life satisfaction of the elderly population with myopenia through psychological adaptation mechanisms. In the end, based on the above research results, a series of targeted policy recommendations are put forward, aiming to provide a useful reference for the government and related institutions to formulate more effective strategies for promoting elderly health.

Literature Review

Sarcopenia, a decrease in muscle mass and strength that occurs with age, is particularly prevalent in the elderly population. This symptom may lead to many adverse effects, which in turn can have adverse effects on the overall health and quality of life of the elderly (Agostini et al., 2021). Rooks Daniel believed that resistance training and increased dietary protein can delay or even reverse muscle mass that occurs with aging, alleviating sarcopenia in older adults (Rooks & Roubenoff, 2019). Beckwee David proposed a whole-body strategy to train major muscle groups because sarcopenia affected all skeletal muscles in the body (Beckwée et al., 2019). According to Bagherniya Mohammad's research on the subject, the symptoms of sarcopenia in elderly could be effectively improved by certain nutritional drugs and foods (Beckwée et al., 2019). Lee Sol Hyun selected 142 patients for experiments to determine the factors affecting health-related quality of life in elderly women with sarcopenia (Lee et al., 2023). de Souza Larissa Franciny conducted a study on sarcopenia in order to develop preventive strategies (de Souza et al., 2022). Rong Shuang conducted research on alleviating sarcopenia through dietary and exercise strategies and

found that extracellular vesicles have beneficial effects in increasing muscle regeneration and mediating exercise (Rong et al., 2020). In summary, some achievements have been made in the research of sarcopenia, but there are still shortcomings in the study of patients' psychological and social participation. Therefore, this article applied physical activities to the treatment of sarcopenia, hoping to improve patients' sense of social participation.

Resistance exercise, aerobic exercise, and balance training in physical activities are considered important means of treating sarcopenia. It is necessary to tailor an exercise plan according to individual conditions and combine it with nutritional interventions to enhance skeletal muscle quality and improve muscle strength, in order to achieve optimal therapeutic effects (Oliveira et al., 2020). Sarcopenia is a physiological and pathological process associated with aging that is caused by loss of muscle mass and strength. According to Bonato Matteo, although there was currently no cure for sarcopenia, physical activity appeared to be a particularly effective way to counteract the age-related loss of muscle mass and strength (Bonato et al., 2020). Barajas-Galindo David E believed that early treatment is crucial, and physical exercise is the most effective treatment method to improve symptoms of sarcopenia (Barajas-Galindo et al., 2021). There is still controversy over drugs for sarcopenia. The method of restoring muscle health studied by Nasso Rosarita referred to physical exercise (Nasso et al., 2024). Sarcopenia and lack of exercise can affect clinical outcomes in older adults. Therefore, Ohtsubo Takuro assessed the relationship between skeletal sarcopenia and physical activity and functional outcomes in hospitalized rehabilitation patients (Ohtsubo et al., 2022). Kumar Prabal customized a combination of exercise plans and exercise strategies based on existing fitness levels and target outcomes for sarcopenic elderly individuals, with the aim of improving muscle mass (Kumar, Umakanth, & Girish, 2022). Overall, the application of physical activities or exercise in the treatment of sarcopenia is relatively abundant, laying a theoretical foundation for the following research in this article.

While physical activity as a treatment for myopenia has a lot of potential, there are still certain gaps in literature. Firstly, more work needs to be done to maximize the standardization and customized design of physical activity-specific intervention programs in order to increase patient compliance and efficacy. Second, more research is required to fully understand the mechanism of action and long-term impacts of physical activity on the social and psychological functioning of myopenia patients. Ultimately, multicenter studies and interdisciplinary collaboration will contribute to a more thorough evaluation of the overall advantages of physical activity in the management of myopenia. In conclusion, research indicates that exercise has great promise for treating myotonia. It can effectively enhance the muscular mass and strength of patients with myotonia by the comprehensive application of resistance exercise, aerobic exercise, balance training, and nutritional intervention, consequently enhancing their quality of life and sense of social involvement. To fully improve the treatment effect of myopathy, it will be necessary to further strengthen the design of standardized and customized intervention programs, thoroughly investigate the long-term effects of physical activity on the psychological and social levels and encourage interdisciplinary cooperation and multi-center research.

Data and Methods

This article takes elderly people aged 65 and above in urban area A as the survey subjects, conducts screening tests for sarcopenia, and randomly divides elderly people with sarcopenia into two groups (Lu et al., 2021). The technical roadmap of the research is shown in Figure 1.

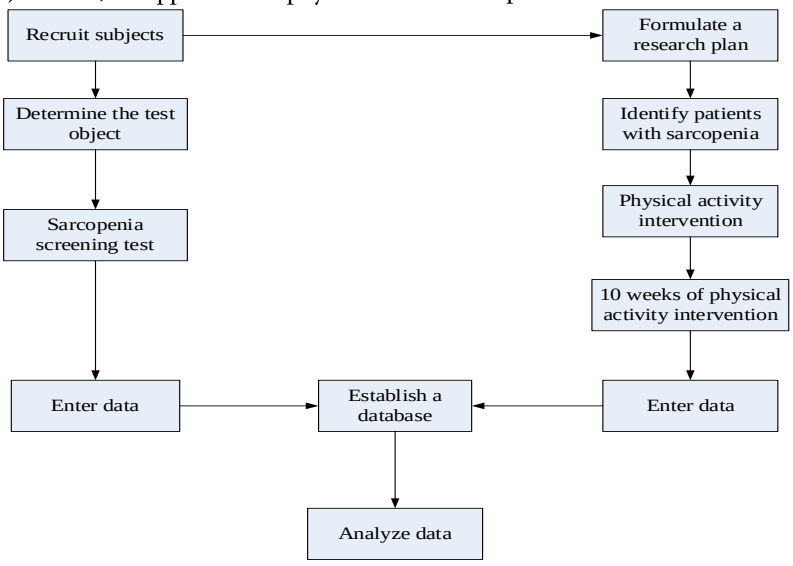

Figure 1: Technical Roadmap for Research.

Patient Information

This study recruits 70 elderly people aged 65 and above as research subjects based on 10 community elderly care institutions in urban area A. After screening, 60 patients are finally identified, including 30 male and 30 female patients. The elderly are informed about the goal and importance of this study in a number of ways. Next, using the random number table method, the study participants are split into two groups of 30 patients each: an experimental group and a reference group.

Diagnostic Criteria

The Chinese Medical Association has drawn on other countries' research and proposed a screening and evaluation method for sarcopenia, which suggests measuring walking speed, grip strength, and muscle mass to determine sarcopenia (Donini et al., 2020; Donini et al., 2022).

Inclusion and Exclusion Criteria

Based on the screening results of sarcopenia, all subjects studied in this study meet the inclusion criteria. Inclusion criteria: meeting the diagnostic criteria for sarcopenia, being over 65 years old, maintaining stable condition within 6 months, and understanding and actively participating in the study (Dong et al., 2021; Makizako et al., 2019). Exclusion criteria: impairment of vital organ function and acute phase, presence of cognitive, communication, or hearing impairments, loss of self-care ability, and non-compliance with regulations (He et al., 2021).

Experimental Methods

Reference group: Compared with the experimental group, the elderly in this group maintain their current lifestyle habits and daily activity levels, do not undergo specific physical activity interventions, and only receive routine health management and follow-up (Kobuchi et al., 2020; Zhao et al., 2022). Experimental group: The elderly in this group participate in physical activity intervention, including routine aerobic exercise, resistance exercise, and balance training, aiming to comprehensively improve the patient's muscle strength, endurance, and balance ability, and ensure the safety and effectiveness of the exercise. The daily exercise time is 45 minutes, with 4 sessions per week for 10 weeks of training to ensure sufficient exercise stimulation. In addition, psychological counseling services are provided to focus on the mental health status of the elderly, assist them in establishing a positive attitude towards life, and alleviate negative emotions caused by illness.

Indicators

Muscle mass and strength

Using the Inbody270 body composition analyzer, limb skeletal muscle mass and body weight are measured for each myotonic dystrophy patient to determine the Skeletal Muscle Mass Index (SMI) (Fukuoka et al., 2019; Ohara et al., 2020). In order to measure the muscle strength values of each patient, the patient is required to hold the grip with maximum force and hold it for 2 seconds. This procedure is performed three times with a one-minute break in between and the maximum value is taken as the result. The measurement of walking speed is achieved by observing the time it takes for the patient to walk a 6-meter straight line at their daily walking speed, and accurately recording it with a stopwatch. The Berg Balance Scale (BBS) has 14 elements with a maximum score of 56 and is used to assess a person's balance ability (Takeda et al., 2024; Viveiro et al., 2019).

Self-rated health status

Self-rated health status, also known as Self-rated Health Measurement Scale Version 1.0 (SRHMS), is an important health scale that typically measures health through a simple questionnaire and provides several options for respondents to choose from to assess their health level (Storey et al., 2020; Zhang et al., 2024) The SRHMS asks study participants to score on a scale of 0-100. To help respondents better understand the significance of the scores, references to the range of health status scores are provided: 0 to 20 is very poor; 21 to 40 is poor; 41 to 60 is average; 61 to 80 is good; 81 to 100 is very good (Leopold, 2019).

Depressive condition

The Chinese version of Geriatric Depression Scale (GDS-15) is utilized to assess depression in patients with sarcopenia. This scale consists of 15 items and requires participants to answer yes (1 point) or no (0 points) based on their past week's feelings (Park & Kwak, 2021; Zhang et al., 2020). The maximum value of this scale is 15, and the higher the score, the more depressed a person is. Studies have shown that a score of 0-4 shows no depression, with mild depression being 5-9, moderate depression being 10-13, and severe depression being 14-15 (Acosta Quiroz, García-Flores, & Echeverría-Castro, 2021).

Quality of life and general self-efficacy scale

The Generic Quality of Life Inventory-74 (GQOLI-74) is utilized to evaluate the quality of life of elderly patients with sarcopenia. The scores of the GQOLI-74 scale range from 0 to 100, evaluated from multiple dimensions, with scores for each dimension ranging from 0 to 100. When the scores are high, the condition of the relevant dimensions is better (Carlozzi et al., 2019; Li et al., 2020). The General Self-Efficacy Scale (GSES) consists of 10 items and adopts a Likert 4-point rating system, with scores ranging from 1-4. Higher total scores indicate greater self-efficacy (Di et al., 2023; Novrianto, Marettih, & Wahyudi, 2019).

Data Processing

If the data are normally distributed, they can be characterized by using the mean±standard deviation (that is, x±s). When classifying data, chi square test is an effective classification method for unordered data; for ordered data, rank sum test may be more applicable. This study uses Statistical Product and Service Solution 25.0 software to analyze experimental data. An independent sample t-test is utilized to analyze the gender differences in indicators before and after the experiment.

Ethical Considerations

This study closely adheres to ethical guidelines. Every participant has given their signed consent, acknowledging that they are aware of the study's goal, methodology, potential risks and rewards, and that they have the option to withdraw from it at any time. The participants' personal information is handled with confidentiality by the research team, and all data is utilized exclusively for legitimate scientific research. To further guarantee the security and efficacy of the study process, data monitoring and security measures are included. The study team has prepared an emergency plan and formed a collaborative partnership with nearby medical institutions to ensure prompt and efficient medical support in the event of any bodily pain or unforeseen circumstances.

Experiment on Sarcopenia in Elderly Patients

60 elderly patients with sarcopenia are randomly divided into two treatment groups, with 30 patients in each group, as illustrated in Table 1.

In Table 1, the two groups do not show statistically significant differences in key indicators such as gender distribution, age, weight, height, fat content, and body mass index (P>0.05), which ensures the consistency between the experimental and reference groups at the baseline level, and provides a solid foundation for the subsequent exploration of the effects of physical activity on the sense of social participation in elderly patients with sarcopenia.

Table 1

Basic Information of Experimental Subjects

Indicator	Experimental group	Reference group	t-value	P-value
Gender distribution (male: female)	7:8	8:7	0.386	0.142
Age (years old)	73.4±6.1	73.8±6.2	1.964	0.261
Weight (kg)	56.4±10.6	56.1±9.8	-0.638	0.558
Height (cm)	163.4±4.2	163.8±4.3	0.268	0.863
Fat content (%)	28.1±2.9	28.673.4±2.4	-0.452	0.682
Body mass index	21.8±1.2	21.6±1.2	1.369	0.912

Impact on Social Participation Sense

Adopting a broader concept of social participation, the social participation of the elderly is divided into aspects such as indoor self-participation, personal entertainment activities, social life independent participation, family role self-participation, outdoor self-participation, etc. Each aspect is worth 20 points out of a total of 100 points. The effect of physical activity on the social participation of elderly people with sarcopenia is investigated by means of a questionnaire. Table 2 shows the specific research results.

Table 2

Effect of Physical Activity on Social Participation of Elderly People with Sarcopenia

Dimension	Before and after the experiment	Reference group	Experimental group	t-value	P-value
Indoor self-participation	Before	7±2.3	8±2.1	1.38	0.686
	After	10±1.6	12±1.4	1.64	0.512
Personal entertainment activities	Before	6±2.22	6±1.86	1.05	1.26
	After	8±1.76	15±2.08	3.41	0.004
Independent participation in social life	Before	7±2.6	7±3.1	0.964	1.062
	After	10±2.1	14±2.8	2.86	0.024
Family role self-participation	Before	6±1.1	6±1.68	1.36	1.364
	After	8±1.21	16±3.51	3.16	0.002
Outdoor self-participation	Before	6±0.8	5±0.6	1.52	0.792
	After	10±1.6	19±3.8	3.89	0.001
Total score of social participation	Before	32±4.3	32±4.8	1.64	0.697
	After	46±4.9	76±6.7	3.29	0.018

As shown in Table 2, the experimental group shows significant improvement in multiple dimensions before and after the experiment. The experimental data shows that before the physical activity intervention, no significant differences are found between the experimental and reference groups in terms of total scores and various aspects of social participation ($p>0.05$), suggesting that the two groups of elderly people have comparable levels of initial social participation. However, after intervention with physical activities, the experimental group shows significant improvements in various social participation indicators, especially in personal entertainment activities, family role self-participation, and outdoor self-participation, with P-values of 0.004, 0.002, and 0.001, respectively, all of which are less than 0.01 and have very significant differences. Meanwhile, the overall social participation score of the experimental group increases by 44 points from 32 to 76 points before and after the experiment, with a P-value of 0.018 ($P<0.05$), suggesting a significant change. In contrast, the reference group shows relatively small improvements in all dimensions. These data indicate that physical activities not only promote the physical health of elderly people with sarcopenia, but also significantly enhance their sense of social participation and quality of life, emphasizing the important role of physical activities in the overall health of the elderly.

A survey of two groups of elderly patients with sarcopenia is conducted. The difference in physical health between two groups of patients after a period of physical exercise is examined by adjusting the variables of physical activity. The results are described in Table 3.

Table 3

Comparison of Physical Health Status Between Two Groups of Patients

Dimension	Before and after the experiment	Reference group	Experimental group	t-value	P-value
Walking speed (m/s)	Before	0.67±0.18	0.65±0.19	1.631	0.214
	After	0.76±0.16	0.91±0.17	-8.036	0.000
Grip strength (kg)	Before	19.14±4.93	19.41±4.63	-0.351	0.728
	After	20.61±5.03	22.56±4.38	-2.024	0.025
SMI (kg/m^2)	Before	5.87±0.71	5.79±0.63	0.572	0.563
	After	6.24±0.74	6.61±0.72	-2.114	0.046
BBS score	Before	42.85±5.38	42.96±4.13	0.638	0.582
	After	45.37±3.73	49.02±3.64	2.314	0.001

As shown in Table 3, this study focuses on the elderly population with sarcopenia and conducts a comparative experiment to investigate the improvement effect of physical activity on their physical fitness. Regarding walking speed, grip strength, SMI, and BBS, the two groups have no significant difference between them before the experiment ($P>0.05$), indicating that the two groups are in the same physical condition. After the experiment, the reference and experimental groups show significant differences in multiple dimensions: the walking speed and BBS score significantly improve, with P-values of 0.000 and 0.001, respectively ($P<0.01$), indicating a very significant difference, reflecting significant improvements in balance and gait function in the elderly; the grip strength and SMI of the experimental group also improve significantly after the experiment, with P-values of 0.025 and 0.046 ($P<0.05$), respectively, suggesting a significant difference and reflecting the positive impact of physical activity on muscle mass. These changes not only reflect the positive effect of physical exercise on the physical function of the elderly, but also further emphasize the importance of social participation, because actively participating in physical exercise not only enhances the physical fitness of the elderly, but also promotes social interaction and mental health, which helps to improve their quality of life and happiness.

Impact on Life Satisfaction

SRHMS is used to study the life satisfaction of elderly people with sarcopenia, and SRHMS can be divided into five levels: very poor, poor, average, good, and very good. Investigations are carried out on the two groups of patients taken to study the distribution of the two groups of patients at each level, as shown in Figure 2.

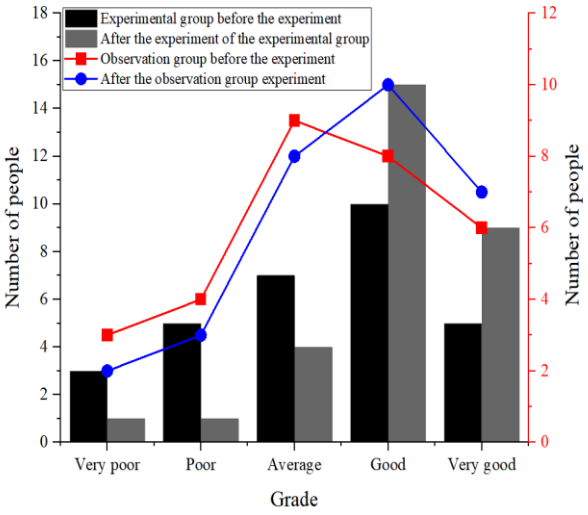

Figure 2: Effect of Physical Activity on SRHMS Class Distribution in Elderly with Sarcopenia

As shown in Figure 2, it can be clearly observed that physical activity has a positive impact on the level distribution of SRHMS in elderly people with sarcopenia. Before the experiment, the distribution of the two groups on various levels of SRHMS is relatively close, with many elderly people with sarcopenia having self-reported health at average or below. However, after the experiment, the self-rated health of the elderly in the experimental group shows significant improvement, with a significant decrease in the number of poor and very poor grades, while the number of good and very good grades increases significantly, especially the number of good grades increases from 10 to 15. However, there is little change in the reference group after the experiment, which also indicates that conventional intervention methods have limitations in improving the health of elderly people with sarcopenia. In summary, physical activities may have multiple effects, such as enhancing muscle strength and improving physical function, effectively promoting the improvement of the health of elderly patients with sarcopenia and increasing their life satisfaction. Physical activities not only directly affect the recovery and improvement of patients' physical functions but may also indirectly improve the life satisfaction and happiness of the elderly by reducing pain, enhancing confidence, and increasing social interaction, effectively improving the quality of life of the elderly people with sarcopenia.

By participating in physical activities, the life satisfaction of elderly people with sarcopenia can be greatly improved. This article uses the GQOLI-74 score evaluation to study the life satisfaction of elderly people with sarcopenia. The research findings are displayed in Table 4.

Table 4

Study on The Effect of Physical Activities on Life Satisfaction of Elderly People with Sarcopenia

Dimension	Before and after the experiment	Reference group	Experimental group	t-value	P-value
Somatic function	Before	64.8±6.8	65.1±7.1	0.31	0.786
	After	70.5±6.8	79.4±6.3	3.48	0.012
Psychological function	Before	61.8±7.68	61.6±7.51	0.57	1.06
	After	65.1±7.9	74.6±8.4	5.96	0.001
Social function	Before	67.3±5.1	67.8±5.6	0.82	1.142
	After	71.4±6.3	78.4±5.9	4.22	0.014
Material life	Before	69.8±11.81	69.9±12.7	0.681	1.164
	After	73.4±11.7	80.1±10.8	3.18	0.008
Environmental function	Before	67.3±8.9	67.1±9.2	0.448	0.892
	After	70.4±9.6	77.8±8.4	4.08	0.011

As shown in Table 4, this study uses GQOLI-74 to investigate how physical activity affects the life satisfaction of elderly people with sarcopenia. According to Table 4, it can be found that the quality of life of the elderly in the experimental group shows significant improvement in multiple dimensions after participating in physical activities. Before the experiment, the scores of the reference and experimental groups in dimensions such as physical function, psychological function, and social function are similar, and there is no statistically significant difference ($P>0.05$), indicating that the quality of life of the two groups of elderly people is comparable in the initial stage. However, after the experiment, the scores of the elderly in the experimental group significantly improved in all dimensions, with P-values of 0.012, 0.014, and 0.011 for physical function, social function, and environmental function, respectively ($P<0.05$), indicating significant differences. Psychological function and material life improvement are particularly prominent, with P-values of 0.001 and 0.008, respectively ($P<0.01$), indicating very significant differences. These results strongly demonstrate that physical activities can not only improve the physical health of elderly people with sarcopenia, but also significantly enhance their life satisfaction, strengthen their mental health, promote social interaction, and comprehensively improve their quality of life.

Impact on Psychological Adaptation

Participating in physical activities can release positive emotional substances such as endorphins, which can help generate happiness and satisfaction, reduce anxiety, and improve emotional stability. Therefore, this article uses GDS-15 to study the depression situation of elderly people with sarcopenia and divides the degree of depression into four levels: no depression, mild depression, moderate depression, and severe depression. Figure 3 shows the specific experimental results.

As shown in Figure 3, the distribution of depression levels between the experimental and reference groups is quite close before the trial, with 5, 8, 10, and 7 patients in the

experimental group being no depression, mild depression, moderate depression, and severe depression, respectively, and 6, 7, 10, and 7 in the reference group. After a period of physical activity intervention, the experimental group shows significant positive changes after the experiment. The number of people without depression increases from 5 to 13, an increase of 8 people, which is also 4 more than the reference group after the experiment. This indicates that physical activity helps promote positive changes in the mentality and emotional well-being of elderly patients with sarcopenia. Meanwhile, a significant decrease in the number of patients presenting with mild, moderate, and severe depression is observed in the experimental group, which is 4, 7, and 6 cases, respectively. Especially, the reduction in mild depression is the most significant, from 8 to 4, showing the remarkable effectiveness of physical activity in alleviating mild depression in elderly people with sarcopenia. In contrast, the reference group that does not participate in physical activities shows little change in depression levels after the experiment, with only a slight increase in the number of non-depressed individuals to 9, while the number of depressed individuals at other levels remains stable. This further highlights the positive role of physical activities in improving depression in elderly people with sarcopenia. In summary, these results strongly support the view that physical activities can effectively alleviate depression and improve emotional stability in elderly people with sarcopenia.

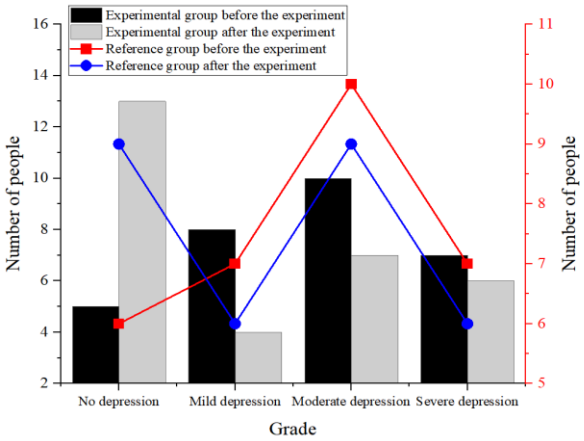

Figure 3: Study on The Distribution of GDS-15 Grades in Elderly Patients With Sarcopenia Affected by Physical Activities.

A study is conducted on the psychology of the selected patients, divided by the degree of depression. GDS-15 is used for research to obtain the scores of the experimental group and the reference group of sarcopenia elderly patients before and after the experiment. The average scores before and after the experiment are calculated to understand whether there is a significant effect of physical activity on the psychology of elderly patients with sarcopenia. The detailed findings of the study are illustrated in Table 5.

Table 5

Comparison of GDS-15 scores between two groups of patients

Two groups	Before the experiment	After the experiment
Experimental group	9.47±3.92	7.23±3.31
Reference group	9.43±4.11	8.27±3.67
t-value	1.34	3.58
P-value	0.823	0.011

As shown in Table 5, in-depth research is conducted on the psychological status, especially the degree of depression, of elderly patients with sarcopenia. The depression status in the experimental and reference groups is evaluated using the GDS-15 score before and after the experiment. Prior to the experiment, the mean depression scores of the experimental group and the reference group are comparable, 9.47 and 9.43, respectively, with a t-value of 1.34 and a P-value of 0.823 ($p>0.05$), which implies that no significant difference exists between the depression levels of the two patient groups prior to the experimental intervention. However, after the experiment, the depression score of the experimental group significantly decreases to 7.23 points, a decrease of 2.24 points, while the score of the reference group decreases slightly but does not change much, to 8.27 points, a decrease of only 1.16 points. The experimental group is 1.04 points lower than the reference group after the experiment. The t-value is 3.58 and the P-value is 0.011 ($P<0.05$), indicating a significant difference between the two groups, suggesting that physical activity significantly improves the depressive mood of the experimental group patients.

This article uses the General Self-Efficacy Scale to conduct experimental analysis on elderly people with sarcopenia. By comparing the changes in GSES scores of two groups of patients before and after the experiment, the changes in self-efficacy between the two groups of patients before and after the experiment are compared. The improvement of self-efficacy is helpful for elderly people to maintain a positive attitude towards life. The specific findings are illustrated in Table 6.

Table 6

Changes in GSES scores before and after the experiment for two groups of patients

Two groups	Before the experiment	After the experiment
Experimental group	17.9±6.61	28.9±6.28
Reference group	17.7±5.82	22.9±5.11
t-value	1.94	5.06
P-value	1.26	0.008

As shown in Table 6, this study conducts in-depth experimental analysis on elderly people with sarcopenia using GSES, further exploring how this influence helps them maintain a positive attitude towards life. Before the experiment, the GSES scores of the experimental group and the reference group are similar, with 17.9 and 17.7 points respectively, a t-value of 1.94, and a P-value of 1.26 (P>0.05), indicating that the two groups of elderly people have a comparable level of self-efficacy before the experiment, and no significant differences exists. However, after the experiment, the experimental group's GSES score significantly improves to 28.9, an increase of 11 points compared to before the experiment, while the improvement of the reference group after the experiment is relatively limited, with an average score of 22.9 points, only an increase of 5.2 points compared to before the experiment. Moreover, the experimental group scores 6 points higher than the reference group after the experiment. The t-value is 5.06 and the P-value is 0.008 (P<0.01). Currently, a highly significant difference exists between the two groups, suggesting that physical activity significantly increases the self-efficacy of the elderly in the experimental group.

Discussion

In the elderly, the incidence rate of sarcopenia cannot be ignored, which makes patients face higher risk of falls and fractures, and may also lead to an increase in the incidence of other diseases, thus seriously affecting the quality of life of elderly patients (Hui & Shan, 2019; Xin-Yu et al., 2020). Therefore, it is particularly important to explore effective treatment options for elderly patients with sarcopenia. This article innovatively attempts to apply physical activities into the treatment of sarcopenia in elderly patients, so as to explore the impact of physical activities on patients' social participation, quality of life, and mental health. This study found that physical activity has shown significant effects in improving the pace, grip strength, SMI (skeletal muscle index) and balance ability of the elderly with myopenia. This is consistent with the results of a number of studies in recent years. For example, a systematic review of strength training for the elderly showed that regular strength training can significantly increase muscle mass, improve muscle strength, and reduce the risk of falls. These physiological improvements are mainly due to the stimulating effect of physical activity on muscle fibers, which promotes the synthesis of muscle protein and the increase of muscle mass (Grgic et al., 2020; Ren et al., 2022). At the same time, it also improves neuromuscular coordination, thereby improving balance. Further, physical activity may also provide a more stable support foundation for the elderly by enhancing bone density and joint stability and reduce the risk of fractures caused by osteoporosis. These improvements also show that physical activity plays an active role in enhancing muscle strength and improving the body's nutrition and metabolism in elderly patients, and further shows that physical activity-based interventions are of great significance in the treatment of myopenia.

In this study, by comparing the changes in the sense of social participation of the experimental group and the reference group before and after the intervention of physical activity, it was found that physical activity has a significant effect on enhancing the sense of social participation of elderly patients with myopenia. After receiving the intervention of physical activities, the experimental group's sense of social participation in personal entertainment, family role self-participation, etc. was significantly improved, and there was a very significant correlation (P<0.01), and the total score of social participation was also greatly improved. This finding not only confirms the role of physical activity in improving the physical function of the elderly, but also highlights its positive impact in promoting social interaction and mental health of the elderly. Such as Tanaka, T. et al pointed out that physical activity can enhance social connections and participation among the elderly, reduce loneliness and social isolation. This improvement was mainly attributed to the physical activity providing more social opportunities for the elderly and enhancing their self-confidence and social skills (Tanaka et al., 2022). By participating in sports activities, the elderly can get more opportunities for social interaction, thereby strengthening their connection with society and enhancing their sense of social participation and belonging. This kind of improvement can help the elderly maintain a positive attitude to life, reduce loneliness

and depression, and thus improve the overall quality of life. However, it is worth noting that there may be differences in the impact of different types and intensities of physical activity on the sense of social participation. Future research can further explore which form or intensity of physical activity is more suitable for enhancing the sense of social participation of the elderly with myopia and considering the influence of individual differences and social and environmental factors.

Through research, it can be found that elderly patients with sarcopenia who participate in physical activities have significantly improved their quality of life and life satisfaction. This finding is consistent with the research results of Beaudart et al. (2023), who pointed out that physical activity can significantly improve the quality of life of the elderly by improving their psychological state and enhancing their sense of self-efficacy. After participating in physical activities, the experimental group in this article significantly improves their quality of life in various aspects such as physical, psychological, social function, and material life, especially in terms of psychological and material aspects. This further demonstrates the importance of physical activities in enhancing the quality of life of elderly patients with sarcopenia. This article also delves into the positive impact of physical activity on the mental health of elderly patients with sarcopenia. Through the evaluation of GDS-15 and GSES scales, it is found that physical activity can significantly reduce depression in elderly people ($P<0.05$) and enhance their self-efficacy ($P<0.01$), thereby promoting their psychological adaptation. Physical activities stimulate the release of positive emotional substances, bringing joy and satisfaction to the elderly and helping to maintain emotional stability. Meanwhile, participating in physical activities can also enhance the confidence and ability of the elderly to cope with challenges.

There are still certain inconsistent findings or unsatisfying places, despite the fact that this study indicated that physical activity significantly improves the sense of social engagement, life satisfaction, and psychological adaptation of the elderly with myopia. For instance, after engaging in sporting activities, some senior citizens did not exhibit a discernible increase in social participation or psychological betterment. Individual variations, the kind and intensity of the activity, and the length of the intervention are possible correlations with this. We need to investigate the impact of individual differences on the effect of physical activity further in order to better understand the reasons underlying these contradicting results. When engaging in physical activities, older individuals may exhibit varying reactions and effects depending on their age, gender, and health status. To make more precise suggestions for future intervention programs, we also need to investigate the distinct effects of various physical activities on the physical and mental health of the aged.

Conclusions

Through experiments and data analysis, it is found that physical activity has a significant effect on enhancing the life satisfaction of elderly patients with sarcopenia. Specifically, participating in physical activities can significantly enhance the social participation of elderly people with sarcopenia, allowing them to demonstrate a more positive attitude towards integration. This not only effectively reduces patients' loneliness, but also broadens their social channels. At the same time, physical activities have significantly improved the life satisfaction of the elderly, mainly due to the enhancement of physical health and the enrichment of spiritual life, allowing them to enjoy their old age more happily. In addition, physical activities also promote the psychological adaptation mechanism of the elderly, helping them build positive coping strategies, improve self-efficacy, and make them more confident and composed when facing challenges.

Based on the above findings, the following suggestions are put forward: first, encourage and support the elderly with muscular dystrophy to actively participate in suitable physical activities, and promote their physical function recovery and social participation through the formulation of personalized exercise programs; second, medical institutions, community organizations and families should work together to create more physical activity opportunities and social platforms for the elderly, and strengthen their social support networks; third, strengthen health education, raise the elderly's awareness of the benefits of physical activity, and stimulate their internal motivation to participate in physical exercise.However, this study also has certain limitations, such as the relatively small sample size and limited geographical coverage, which may affect the universality of the research results.Therefore, it is recommended to further expand the sample size in future studies and conduct cross-regional and cross-cultural comparative studies to more comprehensively reveal the impact of physical activity on the social participation, life satisfaction and psychological adaptation mechanisms of the elderly with myopenia.In addition, it is also beneficial to explore other possible intermediary or regulatory variables, which will help us to better understand how educational activities affect the psychosocial well-being of the elderly.In general, this research provides a new perspective for understanding the importance of the elderly with myopenia participating in physical activities, and provides a scientific

basis for promoting the health of the elderly and improving their quality of life.

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Ethical approval

The paper does not deal with any ethical problems.

Informed consent

The author declares that all the authors have informed consent.

Data Availability

Data is available in the manuscript.

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