International Journal of Frontiers in Medicine
ISSN 2706-6819 Vol.2, Issue 2: 18-27, DOI: 10.25236/IJFM.2020.020203

A Review of Research Progress on the Physical Rehabilitation of the Frail Elderly

Xueping Dong[1,*] and Xingtian Su[2]

[1] *Department of Nursing, The First Hospital of Tianshui, Tianshui 741000, China*
[2] *School of Sports and Health, Tianshui Normal University, Tianshui 741000, China*
[*] *Corresponding author e-mail:gstsdxp@163.com*

ABSTRACT. *The physical health of the elderly is directly related to the quality of life of the individual and the subsequent family happiness. The elderly with a weak body is between the healthy state and the sub-health state in the definition of the health range. This study clarifies the research context and seeks solutions by referring to the current research on the physical rehabilitation of the frail elderly in the existing literature. The study found: The sports rehabilitation method suitable for the frail elderly is limited, and is limited to the physical functional fitness training. The comprehensive physical function training includes aerobic exercise and anaerobic exercise, and is suitable for the frail elderly with stable residences. The scope needs to be further expanded. In addition, the way to improve the balance ability of the elderly can be through long-term low-medium-intensity exercise training to prevent falls in the elderly, improve the physical function of the weak elderly, and effectively adjust the myoelectric potential. High-intensity exercise is at greater risk.*

KEYWORDS: *seniors, sports rehabilitation, physical fitness*

1. Introduction

Physical weakness is a syndrome caused by congenital changes in the body and a series of chronic diseases. It is highly positively related to the health status and mortality of the elderly. It will seriously reduce the quality of life and lifestyle and increase the welfare burden on society. Physical weakness is also known as debilitating in the medical field, mainly in pathology rather than physiology. The concept of weakness is constantly changing with the rapid development of the times, and is showing significant changes. In general, frailty is a group of clinically manifested pathological symptoms, which refers to a series of health-related symptoms and signs such as a series of skeletal muscle loss, physical dysfunction, and neurocognitive loss associated with age. Weakness are common among the elderly, and compared with healthy elderly, the frail elderly are more prone to adverse physical and mental changes such as difficulties in self-care, shortened rest and recuperation, and comprehensive complications.

ISSN 2706-6819 Vol.2, Issue 2: 18-27, DOI: 10.25236/IJFM.2020.020203

China has entered an aging society in an all-round way, gradually showing a contracted social state. The aging trend of the social population is inevitable. How to improve the physique of the frail elderly and improve the quality of life of the frail elderly is an important issue facing at present in China. Under the background of the great era of national health, elderly physical fitness activities, which are closely related to health, have gradually become one of the focuses of the society. As a kind of economic and easy-to-use health behavior, physical fitness activities have a positive effect on improving the health status and production quality of the elderly. At the individual level, delaying aging, enhancing physical fitness, releasing mental pressure, and making the elderly continue to socialize; from a social level, it is conducive to promoting the development of national fitness and truly achieving "lifelong sports" for citizens.

Insufficient exercise and reduced exercise load are the main causes of the elderly's physical weakness. Exercise can improve the balance ability of the elderly, improve the quality of life, reduce the incidence of falls, enhance physiological functions, and at the same time reduce depression, etc., thereby improving the elderly's physical fitness. Physically weak. In the context of the increasing social aging and healthy China strategy, it has become a consensus to identify the elderly who are in the early stage of frailty and frailty as soon as possible, and carry out effective sports interventions and measures. However, the current research on physical weakness in China is mainly about the distribution characteristics and related factors of the state of weakness of the elderly in China. This study summarizes the types and effects of effectively improving the frail elderly people at home and abroad, and provides guidance and reference for the exercise rehabilitation of frail elderly people in China.

2. Sports content

2.1 Type of exercise

At present, exercise therapy for the frail elderly mainly includes endurance training, resistance training and comprehensive functional training [2]. The main forms of endurance training are walking, cycling, jogging, and Tai Chi exercise, among which Tai Chi is currently an effective exercise method to improve the movement of the frail elderly. Resistance training refers to the use of elastic bands, barbells that gradually increase weight, and equipment exercises for various weight training equipment, such as weight lifting exercises, leg press exercises, and parallel bar arm flexion and extension. Resistance exercise enables muscles to improve the muscle strength of athletic muscle groups by overcoming external resistance and improve body function. Comprehensive functional training mainly includes training of muscle stretching, limb flexibility, and balance ability. Comprehensive functional training can effectively improve the muscle strength of the upper and lower torso, neck, and buttocks of the frail elderly and improve the body's functional status .

ISSN 2706-6819 Vol.2, Issue 2: 18-27, DOI: 10.25236/IJFM.2020.020203

Comprehensive functional training includes aerobic exercise and resistance exercise, and there is no requirement for venues and equipment, so it is more suitable for fragile elderly at home practice.

2.2 Exercise intensity

Exercise intensity is an important factor to improve the function of the frail elderly and ensure the safety of exercise. Weak old people are mainly determined by Borg's level of fatigue and target heart rate. The Borg fatigue rating of the frail elderly is 10-12, that is, it is appropriate not to feel fatigue, and the target heart rate reaches 40% -60% of the maximum heart rate. A meta-analysis result shows that long-term moderate- and low-intensity exercise can significantly improve the physical function and quality of life of the frail elderly, and it can also effectively reduce the risk of falling for the elderly and ensure the safety and compliance of the elderly. Studies have shown that low-intensity exercise can effectively improve the functional state of the frail elderly, and high-intensity exercise can not effectively improve the frail state of the elderly, and the exercise risk is greater, and the elderly's exercise compliance is poor.

3. Exercise method

3.1 Resistance exercise

Resistance exercise can significantly increase the bone density of the elderly's lumbar spine and proximal femur, increase the muscle strength of the knee joint, and can effectively reduce the body mass index of the elderly. In addition, resistance exercise can effectively improve the body's flexibility and responsiveness. In a randomized controlled study by Bielsa et al., The intervention group performed resistance exercise exercises 5 times a week, 1 hour each time, and exercise intensity was 80% for 18 weeks. The results showed that the intervention group's walking ability and lower extremity muscle stretching ability were significantly higher than the control group (l <0.05). Ancelotti et al pointed out that high-intensity anaerobic exercise (50% to 70% 1km) is not suitable for the frail elderly, and it is likely to cause muscle damage in the elderly. On the one hand, it may be due to the differences in the age of the participants and whether there is professional rehabilitation guidance that affects the different results of the study; on the other hand, whether high-intensity resistance exercise can effectively improve the health of weak elderly people needs more long-term trials to verify .

3.2 Comprehensive functional training

Research by Simone et al. Shows that through comprehensive training

ISSN 2706-6819 Vol.2, Issue 2: 18-27, DOI: 10.25236/IJFM.2020.020203

including strength and balance ability, which lasts for 90 minutes twice a week for 10 weeks, the lower limb muscle strength, walking speed and balance ability of the elderly are greatly improved At the same time, it can effectively improve the depression status of the elderly, which is consistent with the results of Enrique and other studies. Research by Capello et al. Shows that through comprehensive functional training including flexibility, balance ability, endurance, etc., which lasts for 6 months 3 times a week for 45 to 90 minutes each time, it not only weakens the elderly's lower limb stretching ability and response The ability was significantly improved, and the score of the Berg Balance Scale (BBS) was significantly different from that before the intervention ($P < 0.05$), and the quality of life was also improved.

3.3 Tai Chi exercise

Tai Chi can improve the balance function, sensitivity and coordination of the elderly, at the same time it can eliminate mental fatigue, keep the mood cheerful, and effectively improve depression. Older people with significantly reduced ankle dorsiflexor and ankle plantar flexor muscles will have more difficulty in bending and kneeling, and limited bending and bending will increase the risk of falling. Decreased muscle strength of the iliopsoas and quadriceps muscles will lead to a decline in the elderly's ability to balance, which is the direct cause of the elderly's frequent wrestling. Tai Chi training combines strength training and balance training. Many of the movements require hip, knee and ankle joints to perform centripetal or eccentric movements in all directions. Both centripetal motion and eccentric motion can significantly increase the strength of the flexors and extensors of the knee and ankle joints, maintain the flexibility and toughness of the musculoskeletal, thereby improving the performance of the surrounding tissues of each joint and increasing the strength of the lower limb muscles.

Tudor et al. Divided 216 elders with frail nursing facilities into Taijiquan group and rehabilitation division-directed exercise group. After 12 months of intervention, the frequency of falls of the elderly in Taijiquan group decreased significantly. Compared, it can more effectively improve the balance ability of the elderly, the body function has improved significantly, and the weakness score has dropped [3]. A randomized controlled trial by Crespo et al. Showed that compared with the elderly in the health education group, the elderly in the Taijiquan group were afraid to fall after passing 24 simplified Taijiquan exercises twice a day for at least 25 minutes for a total of 16 weeks. Significantly reduced the degree of functional extension test comparison, significantly improved balance ability, significantly improved cardiopulmonary function, body function has been significantly improved.

4. Research effect

4.1 Security

ISSN 2706-6819 Vol.2, Issue 2: 18-27, DOI: 10.25236/IJFM.2020.020203

Researchers at home and abroad on the safety of exercise therapy are mainly aimed at the effect of exercise on the joint function of the elderly. Whether high-intensity resistance exercise intervention is suitable for frail elderly needs to be further explored; before performing exercise exercises, cardiopulmonary exercise function, heart rate during exercise, blood pressure and other related exercise functions must be tested, and strictly executed according to exercise prescriptions ensure that exercise intensity and exercise time are within the range of safe exercise; do warm-up exercise before exercise, and insist on doing recovery exercise after exercise; if discomfort occurs during exercise, it must be adjusted in time; in addition, in order to reduce or avoid falling during exercise and the occurrence of sports injuries, the elderly are best accompanied when they exercise.

4.2 Fall and fear of falling

Exercise can enhance the elderly's ability to coordinate movement, ability to move, and resist external interference, thereby reducing the incidence of falls and increasing the confidence of the elderly in physical activities [4]. The randomized controlled study of Lautro et al. Used the occurrence of falls as a measure of outcome, and the results showed that exercise greatly reduced the occurrence of falls. Milito's test results show that exercise can effectively reduce the occurrence of falls, but the difference between the groups is not statistically significant, which may be related to the time of exercise. The difference in the physical conditions of the participants in the other two trials will also cause the difference in results . Ronaldio et al. Used the activity balance confidence questionnaire to measure participants' psychological scores for fear of falling. Studies have shown that after 45 minutes of exercise 2 times a week and for 3 months, weak elderly people are obviously afraid of falling. improve.

4.3 Balance ability

The maintenance of human balance depends on normal muscle tone, proper sensory input, brain integration, innervation or inhibition of the skeletal muscle system. Exercise can promote the oxygen supply of neuromuscular blood, enhance muscle strength, and regulate the balance of the weak elderly. For the elderly, preventing and delaying weakness is also important. After using the frailty scale for 1-2 times a week, 90 minutes each time, and continuing for 5 months, the balance score of the elderly in the early stage of frailty was significantly improved. , But no significant difference compared with the control group [5]. As the elderly increase in age, their ability to balance will decline somewhat. Therefore, compared with the control group, the frail elderly in the exercise group effectively delay the frailty.

4.4 Physiological functions

ISSN 2706-6819 Vol.2, Issue 2: 18-27, DOI: 10.25236/IJFM.2020.020203

Exercise can increase muscle activity and joint sensitivity, so that the muscles and ligaments around the joints can be well exercised, and delay the degradation of physiological functions. In particular, balance training and resistance training can significantly improve muscle strength, increase bone density, improve physiological function, and adjust the weak state. Pass the l0m walking time test to observe the participants' gait and pace. The research results show that after 3 weeks After 3 hours of exercise, each time for 1 hour, the gait of the elderly is improved and the pace is significantly improved.

4.5 Myoelectric potential

The movement of bones is associated with the electrical activity of muscles. When muscles contract voluntarily, electrical signals can be generated. Quantitative analysis of electromyographic signals is used in the evaluation of muscle function [6]. When there is myogenic damage or long-term treatment with hormone drugs, the muscle cell membrane has structural abnormalities, inflammatory infiltration, abnormal myoelectric potential, reduced amplitude of the electromyogram, and slowed down, which further leads to skeletal muscle reduction and exercise can be effective Improve muscle cell damage and maintain normal myoelectricity. The study by Ripamonti et al. Showed that compared with the control group that only received routine intervention, the myoelectric amplitude and frequency of the knee and ankle joints of the elderly in the exercise group were significantly increased. Exercise allows the muscles to alternate between tension and relaxation, which helps to improve muscle coordination. When performing moderate to low exercise intensity exercises, the muscle load of the elderly is an affordable medium and small load, and more slow muscle fibers are recruited Participation can enhance muscle strength and muscle control.

4.6 Mental health

Exercise can excite the central nervous system. The movement of muscles is transmitted to the brain through feedback nerves to regulate the emotions of the elderly. Therefore, exercise can make the elderly maintain a relaxed and positive mood and positive optimism. Studies have shown that through exercise once a week, 1 h each time, for 15 weeks, participants ’depression is improved and their quality of life is improved . The study also showed that there were no significant differences in the psychological scores between the test group and the control group after 20 weeks of exercise 3 times a week for 20 weeks. The reason for the difference in the above results may be related to the length of exercise time; in addition, when evaluating the mental state of the elderly, the sensitivity of the meter used is also the cause of the difference.

5.Discuss

ISSN 2706-6819 Vol.2, Issue 2: 18-27, DOI: 10.25236/IJFM.2020.020203

5.1Motivation of frail elderly to participate in physical fitness activities

"Health is the foundation of standing, the foundation of people's livelihood, and the source of harmony." Having a healthy body is a necessary condition for the elderly to enjoy their old age [7]. Since the national promulgation and implementation of the "Outline of the National Fitness Program" in 1995, "developing sports and enhancing people's physical fitness" has always been a core goal throughout China's sports development. Physical activity [8]. For the frail elderly who are in the process of declining or degrading their physical skills, they have a more urgent need for physical fitness activities for the purpose of fitness. It can be inferred from previous studies that the frail elderly have a strong sense of participation in physical fitness activities, and the highest proportion of improving physical fitness is determined by the living conditions of the elderly. The elderly have more free time, More time and energy are spent on physical fitness activities, and with the increase of age, the frail elderly gradually realize the importance of physical health. The second is to prevent and cure diseases and increase physical activity. After entering the old age, the emergence of various diseases makes the life of the frail elderly more difficult. Participating in physical fitness activities can prevent some diseases from occurring to a certain extent. There is also a high proportion of recreational entertainment. Most of the frail elderly people participate in group sports and fitness activities. Studies have shown that participating in sports and fitness activities can increase the happiness of the elderly. Obviously, the elderly do not participate in physical fitness activities to improve sports skills, only a small number of elderly people practice Tai Chi because of their hobbies.

5.2 Correlation between physical activity and chronic diseases of frail elderly

The aging population has led to an increase in the occurrence and prevalence of chronic diseases such as hypertension, heart disease, and cerebrovascular diseases [9]. The 2019 survey results show that 78.8% of the elderly in the country have different chronic diseases, of which 36.1% have hypertension, 10.9% have heart disease, 21.6% have cerebrovascular disease, followed by hyperlipidemia and diabetes , Digestive system diseases, sports organ diseases, genitourinary system diseases, malignant tumors, occupational diseases, etc., the main patient groups of the above chronic diseases are the elderly, and chronic diseases are also the main cause of death for the elderly. Long-term drug treatment will cause more side effects, and it has the disadvantage of bringing huge economic pressure to patients and poor treatment results. Studies have shown that general physical activities in daily life can increase energy expenditure and benefit health, and regular physical exercise can lower blood pressure and improve glucose metabolism, etc., and has an important therapeutic effect.

5.3 Selectivity of the physically weak elderly to sports

ISSN 2706-6819 Vol.2, Issue 2: 18-27, DOI: 10.25236/IJFM.2020.020203

The frail elderly can change the amount of exercise and exercise intensity according to their actual situation, and are not restricted by the venue facilities. Because it is a low-intensity exercise, the frail elderly can not only exercise but also relax during walking (fitness walking). It is a good physical fitness project for the elderly. In the selection of items, it reflects the characteristics of age. For items like balls, the frail elderly show a downward trend with their age. In addition, gender differences are also obvious, and women's choices are more inclined to "rhythm." "Sex" and "rhythm" are more focused on the pursuit of beauty, while men are more inclined to more simple and easy sports such as "running", "fitness path", "cycling". It can be seen that the choice of sports events for the frail elderly population, in addition to showing the characteristics suitable for the physiological function characteristics, also shows the characteristics corresponding to the psychological function characteristics.

5.4 The necessity of the frail elderly to carry out scientific fitness regulation

With the increase of aged, all physiological functions of the elderly are declining. The lack of scientific fitness guidance will cause the elderly to cause unnecessary damage during the fitness process [10]. The physical fitness guidance for the elderly group is a scientific fitness guidance with a strong professional nature. It has high professional requirements for every elderly fitness method. Different body functions, different fitness methods and requirements; different regions and environments, different fitness methods; different economic conditions, different fitness methods selected; different physical conditions, different activity content and time selection, and never just one , Regardless of the second. We should not only pay attention to the publicity and education of physical fitness, but also give as much professional knowledge as possible to counseling and preventive measures to prevent diseases actively, so as to achieve a multiplier effect with physical fitness services[11].

5.5 Analysis of the proportion of the physically weak elderly sports population

The fitness mode of the frail elderly is mainly group-oriented, and they gather together for outdoor physical fitness activities, which gives an intuitive feeling that the elderly are the main force in the current national fitness[12]. The survey data shows that adults play a more important role in physical fitness activities. Adults engage in physical fitness activities outside of work, compared to the elderly, they have less free time, so the frequency, time and intensity of exercise for most adults can only reach the level of occasional participation in physical fitness activities. Except for the National Gazette, most of China's current researches have little description of the classification of "proportion of people who regularly participate in physical fitness activities", and some local research questionnaires select mostly community service centers or weak bodies[13]. The gathering place for the elderly to exercise, so the relevant data obtained is not comprehensive enough[14].

ISSN 2706-6819 Vol.2, Issue 2: 18-27, DOI: 10.25236/IJFM.2020.020203

In summary, exercise therapy is relatively safe and effective for the frail elderly. The frail elderly can effectively strengthen the lower extremity muscle strength, improve balance ability, improve body function, improve life quality, and even affect muscle potential has an important effect on preventing and improving the frailty of the elderly. Medical researchers and relevant experts in the field of sports science should formulate scientific and reasonable exercise plans according to the physical conditions, exercise habits and exercise conditions of the elderly, and at the same time strengthen the health guidance for the frail elderly, so as to ensure the safety and effectiveness of exercise therapy sex. A large number of scientific studies have confirmed that exercise intervention can effectively improve the physical function of the frail elderly, but whether it can improve their mental health needs further research and demonstration. In the future, more research will be needed to explore effective sports measures suitable for the frail elderly in China.

References

[1] Duan Zicai, Xu Qi. Research on the assessment and intervention progress of the elderly frailty [J]. Chinese Rehabilitation Theory and Practice, 2015 (11): 1282-1286.
[2] Zhou Shuxin, Liu Jingchang. Guide to exercise prescription for the elderly [J]. China General Medical Sciences, 2006 (20): 1692-1694.
[3] Zhao Yuan, Wang Yan, Xu Xudong. Meta-analysis of Taijiquan exercise on the balance function and fall prevention of the elderly [J]. Journal of Chinese Medicine, 2013 (3): 339-345.
[4] Li Shiming. Application of EMG measurement technology [J]. Chinese Journal of Clinical Rehabilitation, 2006 (41): 149-151.
[5] Lu Aming. Characteristics of bone mineral density changes in the elderly after long-term strength training [J]. Journal of Beijing Sport University, 2013 (7): 74-78.
[6] Longqiang Chen. The Effect of Exhaustion Swimming Training on the Establishment of Trained Animals[J]. Clentifica Magazine-Faculty of Veterinary Sciences, 2020 (30): 211-219.
[7] Zhao Liang. Investigation and Research on Physical Exercises of the Elderly from the Perspective of "Health Dream" [J]. Huainan Vocational and Technical College Report, 2017, 17 (03): 149 ~ 152.
[8] Zhao Xiaoling. Research on the relationship between physical exercise and subjective well-being of the elderly in the main urban area of Chengdu [D]. Chengdu Institute of Physical Education Academy, 2014.
[9] Liu Qianhui. Research on the effect of physical exercise on the quality of life of the elderly [D]. Shandong University, 2013.
[10] Ba Yunqi. A survey of the physical fitness activities of the elderly in Henan Province [D]. Zhengzhou University, 2014.
[11] Tang Xiaoling.Sociological Analysis of the Motivation of Old People's Physical Exercise [J] .Journal of Chengdu Sport University,2000, (04): 30 ~ 33.
[12] Guo Sainu.Study on the present situation and development countermeasures of physical exercise for the elderly in Yantai [D] .Ludong University, 2015.

ISSN 2706-6819 Vol.2, Issue 2: 18-27, DOI: 10.25236/IJFM.2020.020203

[13] Li Qunli. Survey and Research on the Motivation of Sports Participation and Environmental Preference of Urban Elders in Hunan Province [J] .Jilin Institute of Physical Education Journal, 2008, (06): 155 ~ 157.
[14] Kang Riqi. Study on the current situation and strategies of sports activities for the elderly in urban areas of Datong City [D]. Taiyuan University of Technology, 2012.