International Journal of Education and Humanities (IJEH), 4(3) 2024:328-337
http://i-jeh.com/index.php/ijeh/index
E-ISSN: 2798-5768

Optimizing Chronic Disease Management: The Comprehensive Role and Impact of Exercise Interventions in Public Health

Zhao Xingyu[1]

Abstract

With the development of the social economy, changes in living habits, and population aging, the incidence of chronic diseases has increased significantly, becoming a major challenge for global public health. This study explores the significant role and effects of exercise intervention in the management of chronic diseases. Chronic diseases have high mortality rates, substantial disease burdens, and significant impacts on medical expenses. Traditional prevention and control strategies centered on treatment show limitations in addressing these issues. This study aims to examine the effects of exercise intervention as a non-pharmacological therapy, which offers low-cost and high-benefit advantages in the prevention and treatment of chronic diseases. Through systematic review and empirical analysis, this research elaborates on the effects of exercise intervention in improving function and reducing pain in arthritis patients, preventing falls in the elderly, enhancing respiratory function in COPD patients, controlling blood glucose in type 2 diabetes patients, and reducing obesity symptoms. The study's findings indicate that exercise intervention has a significant positive impact on various aspects of chronic disease management. These interventions not only improve the physical condition of patients but also reduce the overall disease burden and medical costs. This research emphasizes the importance of personalized and scientific formulation and implementation of exercise interventions. Specific recommendations regarding exercise intervention are provided for future chronic disease prevention and control strategies. Thus, this study offers precise and applicable guidelines for improving the management and prevention of chronic diseases through exercise intervention.

Keywords: *Chronic Diseases, Exercise Intervention, Sports*

A. Introduction

With the development of social and economic levels, significant changes have occurred in human behavior and living habits, and with the aging of the population, the incidence of chronic non-communicable diseases is increasing. Chronic diseases, also known as chronic non-communicable diseases, refer to a group of illnesses characterized by an insidious onset, long course, and persistent nature, lacking definitive infectious biological etiological evidence. These diseases have complex etiologies and include conditions that have not been fully confirmed. Major chronic diseases include cardiovascular and cerebrovascular diseases, tumors, diabetes, chronic obstructive pulmonary disease (COPD), osteoporosis, chronic liver and kidney diseases, chronic osteoarthropathy, and others. Among them, obesity, hypertension, diabetes, heart disease, and lumbar disc herniation are the most common (World Health Organization, 2020).

The China Chronic Disease Report shows that nearly 300 million people are currently overweight or obese. The number of patients with dyslipidemia reaches 160 million, and the number of patients with chronic diseases is 280 million (China CDC, 2019). The proportion of deaths due to chronic diseases is on the rise. In 2005, the number of deaths nationwide due to

[1]College of Physical Education, Southwest University, Chongqing 400715, China, 1271621116@qq.com

chronic diseases reached 7.5 million (World Health Organization, 2005). Relying solely on disease treatment or health promotion interventions by medical and health departments cannot effectively address the health problems of the population. There is growing evidence of the value of exercise in the prevention and treatment of chronic conditions, and it is likely that in the near future, exercise will become an integral part of medical treatment (Warburton & Bredin, 2017). The linkage between sports and medical treatment will be the most proactive and economical strategy to prevent and control chronic diseases and maintain public health (Naci & Ioannidis, 2015).

This study aims to explore the significant role and effects of exercise interventions in the management of chronic diseases and to provide a comprehensive understanding of the benefits of exercise as a non-pharmacological therapy for the prevention and treatment of chronic conditions. Specifically, the research analyzes the definition, classification, and current status of chronic diseases and their impact on global public health. Additionally, it identifies the limitations of traditional prevention and control strategies that focus on treatment and evaluates the effects of exercise interventions in improving function and reducing pain in arthritis patients, preventing falls in the elderly, enhancing respiratory function in COPD patients, controlling blood glucose in type 2 diabetes patients, and reducing obesity symptoms. The study also aims to provide practical guidance and scientific recommendations on the formulation and implementation of personalized exercise interventions for future chronic disease prevention and management.

Chronic non-communicable diseases (NCDs) such as cardiovascular diseases, diabetes, and chronic obstructive pulmonary disease (COPD) have become increasingly prevalent due to socio-economic development, lifestyle changes, and population aging. These diseases impose a substantial burden on public health systems and significantly affect individuals' quality of life. Traditional approaches, which often rely heavily on pharmacological treatments and medical interventions, may not fully address the root causes or broader impacts of these conditions. While effective to some extent, these treatments can be costly and may come with side effects, failing to offer comprehensive solutions for managing chronic diseases. Exercise interventions present a compelling alternative or complementary approach. Unlike pharmacological treatments, exercise is a low-cost, high-benefit strategy with numerous health advantages. Regular physical activity has been shown to improve cardiovascular health, enhance glycemic control in diabetes, reduce symptoms of depression, and prevent falls in the elderly. Research supports the view that exercise addresses underlying physiological and psychological factors contributing to chronic diseases, making it a holistic approach that can prevent disease progression and improve overall health. Therefore, incorporating personalized and scientifically-based exercise interventions into chronic disease management can significantly enhance patient outcomes, reduce healthcare costs, and improve quality of life, positioning exercise as a crucial element in future prevention and management strategies.

B. Methods

This study employs a multi-faceted methodology to evaluate the role and impact of exercise interventions in optimizing chronic disease management. The research begins with an extensive literature review to build a theoretical foundation. By analyzing current research articles, systematic reviews, and meta-analyses related to exercise and chronic diseases, the study aims to understand the definitions, classifications, and effectiveness of various exercise interventions (Fransen et al., 2015; Juhl et al., 2014). Key databases such as PubMed, Scopus, and Google Scholar will be used to gather relevant studies, focusing on how exercise impacts conditions like cardiovascular diseases, diabetes, chronic obstructive pulmonary disease (COPD), and obesity (Puhan et al., 2011; Umpierre et al., 2011).

Following the literature review, a systematic analysis will be conducted to assess the types and effectiveness of exercise interventions across different chronic diseases. This analysis will involve evaluating the types of exercises (e.g., aerobic, resistance, flexibility), their intensity, duration, and their specific health outcomes (Suhrcke et al., 2006; Tubach et al., 2005). Data from randomized controlled trials (RCTs), cohort studies, and observational studies will be synthesized to compare the effectiveness of various exercise regimens (McCarthy et al., 2015; Fransen et al., 2014). This will help in understanding which interventions are most beneficial for managing specific chronic conditions. In addition to secondary data, primary data will be collected through surveys and interviews with healthcare professionals, patients, and exercise specialists. This empirical research will provide insights into current practices, perceived benefits, and barriers to implementing exercise interventions (Sherrington et al., 2011; Gillespie et al., 2012). Case studies will also be examined to illustrate real-world applications and outcomes of tailored exercise programs, adding practical perspectives to the theoretical findings (Li et al., 2019; Zhao et al., 2010).

The study will integrate the findings from the literature review, systematic analysis, and empirical research to offer a comprehensive understanding of how exercise contributes to chronic disease management. Based on this integration, practical recommendations will be provided for optimizing exercise interventions. These recommendations will include guidelines for designing and implementing personalized exercise programs, strategies for overcoming implementation barriers, and suggestions for incorporating exercise into standard treatment protocols, aiming to enhance overall public health outcomes (Look Ahead Research Group et al., 2013; Wang & Hou, 2018).

C. Findings and Discussion

1. The Harm Of Chronic Diseases And Exercise Treatment Options

The Harm Of Chronic Diseases

Chronic diseases are a group of diseases represented by cardiovascular and cerebrovascular diseases (such as hypertension, coronary heart disease, stroke), diabetes, malignant tumors, and mental illness. Chronic conditions have become a global public health priority. In recent years, the prevalence of chronic diseases has increased significantly in China, and chronic diseases have become the main cause of death among residents in China. The mortality rate caused by chronic diseases is 85%, and the disease burden caused by chronic diseases accounts for 70% of the total disease burden (People's Republic of China, 2020). Suhrcke et al. (2006) studied the effect of cardiovascular disease on economic growth and found that for every 1% increase in mortality, the economic growth of high-income countries decreased by 0.1%. Chronic diseases significantly increase medical expenses, and medical expenses for patients with chronic diseases are 47.3% higher than the average medical expenditure level.

Exercise plan selection for chronic diseases

Exercise has been gradually confirmed to be able to prevent and treat chronic diseases (Zhu & Li, 2019). Non-drug therapies such as moderate exercise are one of the low-cost and high-benefit methods for changing bad behaviors and living habits, and preventing and controlling chronic diseases. In order to achieve a better effect of preventing and treating chronic diseases through exercise, medical and sports professionals are required to formulate a scientific exercise prescription according to the personal physical conditions of patients, and specify the specific content and amount of exercise, so as to achieve the purpose of scientific and planned prevention of fitness or rehabilitation treatment. Exercise prescription refers to a systematic and

individualized exercise plan (Li, Liang, Gao, et al., 2019) formulated by physicians, rehabilitation therapists, and sports instructors in the form of prescriptions for patients, athletes, and exercisers based on age, gender, physical health, exercise experience, and cardiopulmonary function, as well as the function level of exercise organs. Exercise prescription should be clear about the frequency, intensity, duration, form, and progress of exercise. Juhl et al. (2014) provide evidence on the impact of different types and doses of exercise on pain and disability, indicating the need for tailored exercise plans.

2. The Results of The Exercise Intervention on Chronic Diseases

Joint Inflammation

Exercise helps improve pain and function in patients with osteoarthritis of the hip or knee, regardless of age, disease severity, pain or functional level. It is important to ensure that patients understand that OA is not a wear and tear disorder and that discomfort or pain during exercise does not imply further joint damage. There are many types of exercise that are suitable for people with osteoarthritis, including muscle strengthening, aerobic exercise and range of motion. The movement can be carried out on land or in water (Juhl, et al., 2014; Fransen, et al., 2015; Fransen, et al. 2014). Where possible, it is best to have supervised exercise supplemented by a family exercise program. For overweight or obese people, exercise combined with weight loss is more effective than treatment alone. Structured onshore training, usually by physical therapists.

For knee osteoarthritis, Cochrane recently reviewed 54 randomized controlled trials (RCTs), which compared a series of land-based exercise groups with the control group without exercise and showed useful evidence (Sherrington, et al. 2011). Of these trials, 19 were considered to have a low risk of bias. The quality of evidence for immediate benefit from mean pain score was high (44 RCTs involving 3,527 participants) and the magnitude of effect in the intervention group was considered moderate (standardized mean difference [SMD] -0.49, 95% confidence interval [CI] -0.39 to -0.59) and low; There was an absolute reduction of 12 points on the 0-100 scale when compared to controls [95% CI 10-15], with 0 indicating no pain). The quality of evidence for effects on body function was moderate (44 RCTs involving 3,913 participants) and improved in the intervention group (SMD -0.52, 95% CI -0.39 to -0.64; On the 0-100 scale, 10 points [95% CI 8–13] showed absolute improvement, with 0 indicating no physical disability], which might have clinical significance[9]. The benefits decreased 2-6 months after the end of the exercise intervention, and after 6 months the benefits of pain relief were not maintained, but there were still small benefits for body function (4 improvements, 95% CI 2 to 6). The effect of exercise on quality of life (QoL) (13 RCTs involving 1,073 participants) was considered minimal (SMD 0.28,95% CI 0.15 to 0.40; Over the range of 0–100 (100 being the maximum for quality of life), the absolute change was 4 points (95% CI 2 to 5).

For osteoarthritis of the hip, Cochrane has recently conducted a review of 10 randomized controlled trials involving land-based exercise and no exercise (seven of which were considered to have a low risk of bias), showing useful evidence (Fransen, et al., 2014). 1 High-quality evidence from nine trials (549 participants) that exercise immediately reduced pain after treatment (SMD -0.38, 95% CI% -0.55 to -0.20) and, on a 0-100 scale (the lower the score, the better), by 8 points (95% CI 4 to 11). There was also high-quality evidence (nine RCTs involving 521 participants) that exercise improved body function immediately after treatment (SMD -0.33, 95% CI -0.54 to -0.05), with an absolute decrease of 7 points on a 0-100 scale (95% CIs 1 to 12) (a lower score was better). The pain and body function benefits persisted for at least 3 to 6 months after the exercise intervention. Only 3 small studies (183 participants) evaluated the impact of exercise on quality of life, with overall low-quality evidence showing no benefit (SMD 0.07, 95% CI -0.23 to 0.36). Most exercise studies did not control the strong placebo effect of self-reported OA results because participants were not blinded to subgroup assignment. Therefore, the exact number of benefits directly attributable to exercise cannot be determined.

Prevention of Fall

Well-designed exercise interventions can prevent falls in older people living in the community[10], whether as a single intervention or as part of a multifaceted plan[11]. More effective programs include a focus on improving balance (posture control), which has been identified as a key risk factor for falls.

A 2012 Cochrane review found that exercise as a single intervention reduced the fall rate by 30% in the intervention group compared to the control group. Group and family sports that target balance, strength, and/or health have been found to be effective (Gillespie, et al., 2012). Tai Ji Chuan was also found to reduce the risk of falls (proportion of falls) by 30% (risk ratio [RR] 0.71, 95% CI 0.57 to 0.87 in six randomized controlled trials involving 1,625 participants) [11]. Exercise as a single intervention has not been found effective for those who have significant risk factors for falling but cannot be changed by exercise (Gillespie, et al., 2012). Cochrane found that other evidence-based interventions to prevent falling should be prioritized. For example, in patients with significant visual impairment, the main intervention to prevent falls should be family safety assessment or cataract extraction (Gillespie, et al., 2012). These people may also get other benefits from exercise programs. For patients living in high-support care facilities, exercise as a single intervention is not an effective strategy to prevent falls (Cameron, et al., 2012).

Chronic obstructive pulmonary disease

People with COPD should learn how to control the symptoms during exercise, especially dyspnea (Puhan, et al., 2011). The evidence for pulmonary rehabilitation comes from two Cochrane reviews–one for patients with stable COPD (McCarthy, et al., 2015) and the other for patients admitted to hospital with acute exacerbations of COPD (Puhan, et al., 2011). A review of lung rehabilitation versus stable COPD patients with or without exercise training (65 randomized controlled trials involving 3,822 participants) found that patients receiving lung rehabilitation improved in many outcomes. In the second review (9 RCTs involving 432 participants), patients with acute exacerbation of COPD were randomized to lung rehabilitation or routine care after admission, mortality (odds ratio [or] 0.29, 95% CI 0.10 to 0.84) and readmission rate (or 0.2, 95% CI 0.08 to 0.6; 4, and the 95% CI was 3–8 (Puhan, et al., 2011). Overall, the quality of the trial was rated as medium.

Type 2 diabetes

The evidence supports aerobic exercise, progressive resistance training, or a combination of the two if it is structured (defined as planning, personalization, and supervision) to improve glycemic control (Umpierre, et al., 2011). Given the relative equivalence of aerobic and anti-resistance exercise modalities in terms of metabolic benefits, the choice of exercise modality should be determined by the patient's choice or preference as well as the existence and type of comorbidities. For example, the presence of muscle loss, dyskinesia, osteoporosis, weakness, and osteoarthritis suggests the use of resistance training instead of aerobic exercise, especially if there is also a risk of falling. A comprehensive meta-analysis of the efficacy of exercise control in type 2 diabetic patients, including 47 randomized controlled trials (8,538 patients) (Umpierre, et al., 2011) found that structured, supervised exercise training for at least 12 weeks (23 randomized controlled trials involving aerobic and/or resistance training) was associated with decreased glycated hemoglobin (HbA1c) levels compared with control group participants. Aerobic exercise had similar benefits compared to controls. The combination of aerobic and resistive exercise (-0.51%, 95% CI-0.79% to-0.23%). Patients who exercised more than 150 minutes per week had greater reductions in glycated hemoglobin levels (weighted average difference [WMD] -0.89%, 95% CI-1.26% to-0.51%) compared with patients who exercised 150 minutes per week or less (WMD -0.36%, 95% CI-0.50% to-0.23%). Individual exercise recommendations were invalid (-0.16%, 95% CI -0.50% to 0.18%). The GRADE method is not

used in this review to describe the overall quality of evidence. In a meta-analysis of 35 RCTs in patients with diabetes, the overall effect of structured exercise on glycated hemoglobin levels (-0.67%, 95% CI -0.84 to -0.49) was similar to the effect of metformin addition on insulin therapy (-0.60%, 95% CI -0.30% to -0.91%) (Hirst, et al., 2012). Structured exercise or exercise combined with dietary recommendations has not been proven to reduce the cardiovascular mortality in patients with type 2 diabetes (Wing, et al., 2013). However, a prospective cohort study in Denmark involving 11,205 patients with type 2 diabetes evaluated the risk of death associated with decreased HbA1c levels[19]. A linear relationship was found in patients with an HbA1c index above 8%, with the lowest mortality associated with the greatest decline in HbA1c levels.

Obesity

Obesity is a chronic metabolic disease caused by excessive accumulation and/or abnormal distribution of fat in the body due to the interaction of body weight gain, genetic factors, environmental factors and other factors. When the body eats more calories than consumes, the excess calories are stored in the body in the form of fat, which exceeds the normal physiological needs and then evolves into obesity when the amount reaches a certain value.

Studies have shown that the occurrence and development of certain diseases are related to a high proportion of fat in the body. Li Wenyu pointed out in his research that obesity is the primary cause of cardiovascular disease. According to a report by the World Health Organization (WHO), obesity can lead to cardiovascular and cerebrovascular diseases such as hypertension, diabetes, dyslipidemia, coronary heart disease (CHD), and atherosclerosis (AS). Chang Gai, Liu Hao, and Yang Yi et al. investigated the effect of "Happy Ten Minutes" on obesity-related indicators in primary school students in their 2009 study, "Effects of Happy Ten Minutes Intervention on Obesity-related Indicators in Primary School Students." The study found that during the one-year "Happy Ten Minutes" intervention in schools, the proportion of students with normal weight increased, while the proportion of those with mild and severe obesity decreased. This suggests that the "Happy Ten Minutes" exercise intervention could improve obesity-related indicators among primary school students. However, Dechun Zhang, Shi Jianming, and Xiong Ying et al., in their 2015 study "Scientific Nutrition and Exercise Fitness Intervention on Overweight and Obesity," noted that not everyone is suited for exercise as a method of weight loss. Exercise can be risky, and participants may have underlying conditions that necessitate restrictions. Therefore, a safety monitoring system and professional risk stratification are essential before engaging in weight loss exercise programs.

Zhao Yipin and Song Wei et al. explored the relationship between exercise and obesity, concluding that aerobic exercise reduces fat accumulation by increasing energy consumption, improves insulin sensitivity, and accelerates fat hydrolysis. Their recommendations for weight loss include checking the body before starting exercise, gradually increasing exercise intensity over a 24-week acclimation period, controlling exercise intensity to moderate levels, and maintaining persistent aerobic exercise. Ma Chunlian's study highlighted that specific exercise environments like hypoxia and water can enhance weight loss, and timing of exercise, such as before dinner, may be more effective than exercising after dinner. Yu Feng et al. found that strength training consumes more body fat by improving metabolism and increasing the body's caloric expenditure compared to aerobic exercise, though the latter has higher immediate caloric burn. They also noted that strength training maintains a higher metabolic rate longer post-exercise, leading to greater overall caloric consumption. Moderate strength training can also prevent muscle and skin relaxation, contributing to a more sculpted physique. Combining aerobic and strength training has been shown to significantly improve obesity outcomes.

Osteoporosis

Osteoporosis (OP), as a very hidden systemic degenerative disease of the elderly, has been suffering from an increasing incidence in recent years, which has caused more and more middle-aged and elderly friends. With China's aging society and the increasing number of middle-aged and elderly people, how to prevent and treat osteoporosis among the middle-aged and elderly people has become an urgent problem to be solved in the current century. Among the means of prevention, physical activity is undoubtedly an effective one. Mechanical stress during exercise can stimulate osteoblasts and promote their proliferation and differentiation to maintainThe stability of the skeletal system, on the other hand, if the lack of pressure for a long time, will cause bone loss. A study Wang, Zhao & Li, (2010) has shown that under the influence of mechanical stress, a series of cellular molecules can be formed in the human body during exercise and utilize the effects of signals to complete bone remodeling. Regular mechanical stress has been found to promote BMP-2expression and promote the differentiation of osteoblasts (Sumanasinghe, Bernacki & Lobo, 2022). Exercise intensity has a certain effect on bone maintenance, but different exercise intensities have different effects on bone.

Studies have shown that medium and high intensity aerobic exercise can effectively improve the bone density of the elderly, is the best exercise intensity (Cao, Li, & Zhu, 2016). Calcium also plays a major role in bones, and osteoporosis is closely related to calcium deficiency. Vitamin D can regulate the calcium content in the plasma of osteoporosis patients, but vitamin D needs to be converted into an activated form to promote the absorption of calcium, and sunlight can play a certain role, so the appropriate outdoor exercise can help the human body to absorb calcium, and prevent osteoporosis. Exercise can promote blood circulation of bones and enhance their absorption and utilization of minerals such as calcium. Bones can not only provide the minerals needed by the human body, but also store the extra minerals outside the trabeculae to supplement the bone tissue, thus reducing bone loss. At the same time, exercise can also improve the blood acid-base environment to avoid local blood acidification, accelerate the dissolution of calcium. Blood flow to the bone promotes the transport of calcium and other nutrients and bone formation.

In addition, proper exercise can also improve the function of the digestive system and promote the absorption of calcium. Studies have shown that after treadmill exercise, the contents of calcium and blood calcium in the femur of rats are significantly reduced, while the contents of blood phosphorus and urine phosphorus are significantly increased, which is conducive to the absorption of calcium Wang & Hou (2018) Similarly, studies have found a significant correlation between muscle mass and bone mineral density. Muscle mass includes muscle mass and muscle strength, which can play a decisive role in bone mass and bone structure. Survey results Yan, Yu, & Zhang (2002) show that muscle contraction is an important factor to maintain bone structure, and severe muscle contraction will bring pressure to bone, thus promoting the activity of bone cells and accelerating the generation of bone. Muscle volume and muscle contraction force is in direct proportion to the significantly, the former increases, the latter will become bigger, so that the bone by greater pressure, thus accelerating the growth of bone and mineral accumulation. Bone mineral composition in addition to related to muscle strength, also related to the strength and frequency of the muscle, this is because the body in motion, will cause muscle contraction and excitement, thus increasing the function of nerve cells, increase the content of hemoglobin, at the same time also can increase the motor unit, increase the nerve impulse, thus increasing the strength of the muscle. Female because of the old, bone loss will also cause the reduction of muscle strength, so the lumbar spine and femur bone mineral density has a great relationship with the maximum muscle strength, so the weight of the psoas muscle is the key factor to determine the quality of the vertebrae. In short, exercise can not only maintain muscle strength, but also reduce bone loss and prevent falls and fractures.

At present, a large number of studies have shown that exercise can affect bone reconstruction. Exercise indirectly affect that bone remodeling proces by affecting hormones

and local regulatory factors relate to bone metabolism. exercise can also affect the bone remodeling process by affecting factors such as calcium intake and muscle strength, in order to maintain normal bone mass and increase bone density. However, the relationship between exercise and bone metabolism is very complex. Although some results have been achieved in the current research, the specific results require further research. Liu, Ma & Chen (2001) conducted a study on 200 teachers who were engaged in high-intensity mental work (observation group: 109 males and 99 females, aged 60–70 and 68) and 164 normal subjects (control group: 96 and female: 68, aged 60–79, with an average of 69). The observation group's mental work time in sitting position was 6–8 hours, and the daily housework, sports and entertainment activities mainly due to physical activity were all within 1 hour, while the control group's mental work time in sitting position was 0.5–1 hour, and the daily housework, sports and entertainment activities mainly due to physical activity were all over 4 hours. The results showed that the incidence of osteoporosis in male patients was significantly higher in the observation group than in the control group, while the difference in the incidence of osteoporosis between the observation group and the control group was not significant. Liu, Ma & Chen (2001) compared the biochemical indicators of bone metabolism (63.42 8.11) of 40 elderly cases from Beijing Institute of Physical Education and found that in the active population, the urinary calcium/creatinine (Ca/Cr) ratio reflecting bone absorption was decreased significantly compared with that in the non-active population. In addition, Wang, (2018) conducted research and development of high-intensity exercise, and now they participate in high-intensity exercise, which is of great significance for bone preservation of middle-aged and elderly people and reducing fracture risk.

Finally, exercise as an intervention measure to improve bone mass should be long-term. Exercise can promote blood circulation and neurohumoral regulation, facilitate blood calcium transportation into bone and osteoclast transformation into osteoblast, so as to improve bone density and bone strength and avoid fracture. Can enhance the coordination, flexibility and balance of human body, reduce the chance of falling and injury, reduce the risk of fracture and delay the degeneration of bone; Can promote the absorption of calcium in intestinal tract and gastrointestinal peristalsis, promote digestive function, and improve the absorption rate of dietary nutrients, especially calcium; Can promote the body receptor response, appetite enhancement, increase nutrition and calcium intake, promote the bone calcification; Can improve hormone regulation process and body immune function.

D. Conclusion

Through literature retrieval, sorting out and summarizing, this paper analyzes the therapeutic mechanism and empirical effect of exercise intervention on joint inflammation, prevention of falls, chronic obstructive pulmonary disease, type 2 diabetes, obesity, osteoporosis and hypertension. It has been fully proved that exercise intervention has a direct or indirect effect on the treatment and improvement of chronic diseases, but attention should be paid to the formulation of exercise intervention plan based on the actual physical condition of patients (with or without other basic diseases). Secondly, different types of exercise have different therapeutic effects on chronic diseases. Relevant studies have also shown that for example, in the treatment of type 2 diabetes and obesity, the structural exercise plan has better intervention effect. In the process of exercise intervention, in order to meet the requirements of health, science and rationality, and under the conditions, the electronic equipment was used to monitor the physical condition of the interveners in real time. In summary, exercise intervention enriches the treatment options for chronic diseases and provides new treatment approaches for the improvement of chronic diseases.

References

Cameron, I. D., Gillespie, L. D., Robertson, M. C., et al. (2012). Interventions for preventing falls in older people in care facilities and hospitals. *Cochrane Database of Systematic Reviews*, 2012(12), CD005465.

Cao, K.-y., Li, X.-q., & Zhu, L.-x. (2016). Effects of different intensity of aerobic exercise on bone mineral density and body composition of male elderly. *China Rehabilitation*, 31(2), 91-93.

Chang, G., Liu, H., Yang, Y., Ma, J., Wang, W., & Jiang, G. (2009). Effects of happy ten minutes intervention on obesity-related indicators in primary school students. *China Chronic Disease Prevention and Control*, 17(5), 505-507.

China CDC. (2019). China Chronic Disease Report. Beijing: China CDC.

Fransen, M., McConnell, S., Harmer, A. R., et al. (2015). Exercise for osteoarthritis of the knee. *Cochrane Database of Systematic Reviews*, 2015(1), CD004376.

Fransen, M., McConnell, S., Hernandez-Molina, G., et al. (2014). Exercise for osteoarthritis of the hip. *Cochrane Database of Systematic Reviews*, 2014(4), CD007912.

Gillespie, L. D., Robertson, M. C., Gillespie, W. J., et al. (2012). Interventions for preventing falls in older people living in the community. *Cochrane Database of Systematic Reviews*, 2012(9), CD007146.

Hirst, J. A., Farmer, A. J., Ali, R., et al. (2012). Quantifying the effect of metformin treatment and dose on glycemic control. *Diabetes Care*, 35(2), 446-454.

Jakes, R.-W. (n.d.). Patterns of physical activity and ultrasound attenuation by heel bone among Norfolk cohort of European Prospective Investigation of Cancer (EPIC Norfolk): Population based. *BMJ*, 7279, 140-140.

Juhl, C., Christensen, R., Roos, E. M., et al. (2014). Impact of exercise type and dose on pain and disability in knee osteoarthritis: A systematic review and meta-regression analysis of randomized controlled trials. *Arthritis & Rheumatology*, 66, 622-636.

Li, J.-y., Liang, C., Gao, C., et al. (2019). Research on the connotation and path of body-medicine integration: Taking exercise prescription outpatient service as an example. *Sports Science*, 39(7), 23-32.

Liu, S. J., Ma, X., & Chen, X. Q. (2001). Studies on bone mineral density and biochemical markers of bone metabolism in postmenopausal female physical education teachers and non-exercise aged women. *China Journal of Sports Medicine*, 2, 151-153.

Look Ahead Research Group; Wing, R. R., Bolin, P., Brancati, F. L., et al. (2013). Cardiovascular effects of intensive lifestyle intervention in type 2 diabetes. *New England Journal of Medicine*, 369(2), 145-154.

Ma, C. (2012). Understanding and discussion of new ideas on exercise weight loss. *Sports Research and Education*, 27(6), 120-123.

McCarthy, B., Casey, D., Devane, D., et al. (2015). Pulmonary rehabilitation for chronic obstructive pulmonary disease. *Cochrane Database of Systematic Reviews*, 2015(2), CD003793.

Naci, H., & Ioannidis, J. P. A. (2015). Comparative effectiveness of exercise and drug interventions on mortality outcomes: meta-analysis of randomized controlled trials. *BMJ*, 347, f5577.

Pan, H., & Yi, F. (2010). Clinical observation of Ba Duan Jin exercise on rehabilitation treatment of grade 1 hypertension in the elderly. *Journal of Nanjing Institute of Physical Education*, 9(1), 4-5.

People's Republic of China. (2020). Health in China (full text). Retrieved December 15, 2020, from [URL if available]

Puhan, M. A., Gimeno-Santos, E., Scharplatz, M., et al. (2011). Pulmonary rehabilitation following exacerbations of chronic obstructive pulmonary disease. *Cochrane Database of Systematic Reviews*, 2011(10), CD005305.

Sherrington, C., Tiedemann, A., Fairhall, N., et al. (2011). Exercise to prevent falls in older adults: An updated meta-analysis and best practice recommendations. NSW Public Health Bulletin, 22(2), 78-83.

Suhrcke, M., McKee, M., Arce, R. S., et al. (2006). Investment in health could be good for Europe's economies. *BMJ*, 333(7576), 1017-1019.

Sumanasinghe, R.-D., Bernacki, S.-H., & Lobo, E.-G. (2022). Osteogenic differentiation of human mesenchymal stem cells in collagen matrices: Effect of uniaxial cyclic tensile strain on bone morphogenetic protein (BMP-2) mRNA expression. Mary Ann Liebert Inc.

Tubach, F., Ravaud, P., Baron, G., et al. (2005). Evaluation of clinically relevant changes in patient-reported outcomes in knee and hip osteoarthritis: The minimal clinically important improvement. *Annals of the Rheumatic Diseases*, 64, 29-33.

Umpierre, D., Kramer, C. K., Leitao, C. B., et al. (2011). Physical activity advice only or structured exercise training and association with HbA1c levels in type 2 diabetes. *JAMA*, 305(18), 1790-1799.

Uthman, O. A., van der Windt, D. A., Jordan, J. L., et al. (2013). Exercise for lower limb osteoarthritis: Systematic review incorporating trial sequential analysis and network meta-analysis. *BMJ*, 347, f5555.

Wang, B., & Hou, J. (2018). Effects of long-term aerobic exercise on the expression of vitamin D receptor in bone tissue of aged rats. *Journal of Xi'an University of Technology*, 38(4), 318-323.

Wang, B., & Hou, J. (2018). Effects of swimming on reducing hypertension and hyperlipidemia in middle-aged and elderly. *China Sports Coach*, 26(4), 76-78.

Wang, J. (2018). Effects of swimming on reducing hypertension and hyperlipidemia in middle-aged and elderly. China Sports Coach, 26(4), 76-78.

Wang, L., Zhao, W.-z., & Li, B. (2010). Growth factors participate in bone remodeling under stress. *China Tissue Engineering Research and Clinical Rehabilitation*, 14(33), 6198-6201.

Warburton, D. E. R., & Bredin, S. S. D. (2017). Health benefits of physical activity: a systematic review of current systematic reviews. *Current Opinion in Cardiology*, 32(5), 541-556.

Wenyu, L. (2018). Regulation of eight weeks of aerobic exercise on blood lipid and intestinal flora of adolescent obese (Unpublished doctoral dissertation). Shandong Institute of Physical Education.

World Health Organization. (2005). *Preventing chronic diseases: a vital investment*. Geneva: World Health Organization.

World Health Organization. (2020). *Noncommunicable diseases*. Retrieved from https://www.who.int/news-room/fact-sheets/detail/noncommunicable-diseases.

Yan, L., Yu, C., & Zhang, M. (2002). A survey of osteoporosis in high-intensity mental workers in a university of Beijing. *China Journal of Sports Medicine*, 3, 328-329.

Yu, F., & Yue, X. (2013). Analysis of the value of strength training in the field of weight loss by exercise. *Modern Sports Science and Technology*, 3(36), 19-20.

Zhang, D., Shi, J., Xiong, Y., & Zhang, T. (2015). Intervention of scientific nutrition and exercise fitness on overweight and obesity. *China Food and Nutrition*, 21(2), 76-79.

Zhao, Y., Wang, L., & Song, W. (2010). Biochemistry analysis of obesity and aerobic exercise weight loss. *Network Wealth*, 17, 202-204.

Zhu, J.-y., & Li, H.-w. (2019). Latest progress of exercise intervention for chronic diseases in China. Sports Excellence, 38(11), 98-99.