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Review

Exercise as a therapeutic intervention: A comprehensive review of the psychological benefits in cancer survivors

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Abstract: Cancer is a crucial global health concern, as it is interrelated with many life-threatening diseases. The number of cancer victims who have lived through this ordeal has considerably grown through early cancer detection and treatment. The objective of this paper is to conduct a full amplitude assessment on the problem of how to use exercise as a non-pharmacological therapeutic intervention for cancer patients. This study is to summarize and scrutinize the recent research results so as to provide a definitive theory and apply it to practice, including the modified practical guidelines. Within this framework, this review puts forward the idea that sports, can provide a novel therapeutic pathway for psychological rehabilitation in people by promoting emotional well-being, through the new lens of improving quality of life and self-efficacy, and alongside the other multifaceted psychological benefits of the process. Not only does this article provide a new light to the psychological benefits of exercise interventions, including reaching out to the issues of intervention protocols' optimization, long-term effects' assessment, and exercise's integration with other therapeutic modalities, but it also emphasizes that by refining existing studies, these aspects can be worked on.

Keywords: cancer survivors; exercise therapy; psychological benefits

1. Introduction

On whether alone, a cancer cure is not even a pain, only physically, but also a depression example is given. The studies show that after living with the cancer duration, the survivors experience more psychological problems, such as nervousness and despondency, than the survivors of other diseases. These problems affect them very much and are also barriers to their social functions and quality of life [1–3]. In this regard, the effects of exercise are in the bulletins of several international studies on non-pharmacological interventions and are attributed to the benefits that the psychological well-being of those who have been saved from cancer the intervention may bring. Exercise does not manifest only in the improvement of the states of mind; it also includes the decrease of depression and anxiety levels, the betterment of quality of life, and more adaptability to physical functioning [4,5]. A study has revealed a couple of mechanisms through which physical exercise may be favorable for mental health [6]. This review aims to comprehensively assess the benefits of exercise as a non-pharmacological treatment for mental health in cancer survivors. Additionally, it will analyze how exercise improves emotional health and overall psychological functioning in cancer survivors through multiple pathways, including regulating neurotransmitter levels, enhancing immune function, promoting social interaction, and improving self-efficacy.

To clarify, exercise contributes to the natural release of dopamine, one of the excitatory neurotransmitters in the human body, alongside endorphins whose presence leads to an aperitive mood pattern and disappearance of the signs of depression and anxiety [7]. Additionally, regular physical activity can help patients return to their usual lives [8]. This happens because they start avoiding routine plans and improve their self-confidence and control, which are traits that are essential to psychological adaptability [9]. However, the specific mechanisms and effects of exercise in cancer survivors remain poorly understood. This review will explore the following aspects: firstly, analyzing the impact of cancer on mental health; secondly, examining the overall benefits of exercise for mental health; third, elucidating the mechanisms through which exercise improves mental health, including regulation of neurotransmitter levels, enhancement of immune function, promotion of social interaction, and strengthening of self-efficacy. Finally, we will discuss how exercise interventions can be applied to the psychological rehabilitation of cancer survivors, providing scientific evidence and guidance for clinical practice.

A study has revealed a couple of mechanisms through which physical exercise may be favorable for mental health [10]. To clarify, exercise contributes to the natural release of dopamine, one of the excitatory neurotransmitters in the human body, alongside endorphins whose presence leads to an aperitive mood pattern and disappearance of the signs of depression and anxiety [11]. Additionally, regular physical activity can help patients return to their usual lives [12]. This happens because they start avoiding routine plans and improve their self-confidence and control, which are traits that are essential to psychological adaptability [13]. Besides, exercise is a platform where survivors interact and thus improve their feelings of loneliness and social support by doing collective activities together, which is also very important for a good emotional state and mental well-being [14,15].

Research indicates that physical exercise can alleviate cancer-related fatigue and mood disorders [16–18]. An example of that would be a study done by Zhang and colleagues, which indicated that inflammation was making it worse for women with breast cancer to behave normally [19]. However, exercise could turn the situation around because of its effect on inflammation. In addition, exercise is effective in both the treatment of chemotherapy-induced heart damage and neuropathy, and these may, in turn, lead to an increase in good mood and quality of life [20,21]. Not only do the intervention exercises assist in psychological well-being, but they also improve the quality of life, handle side effects of treatments better, thereby getting close to the potential of arrests and cancer [22,23].

In summary, exercise has multiple positive effects on the mental health of cancer survivors. By regulating neurotransmitters, enhancing immune function, promoting social interaction, and improving self-efficacy, exercise significantly improves patients' emotional well-being and overall psychological functioning. As an important non-pharmacological intervention measure for the psychological rehabilitation of cancer survivors, it plays an indispensable role.

2. Method

Literature searches were conducted mainly using Google Scholar, and then there

were the usual suspects: Google Scholar, Elsevier ScienceDirect, and Web of Science. The search strategy that was employed contained the terms: “exercise,” “exercise interventions,” “cancer survivors,” “cancer,” “psychological benefits,” “cancer patients,” “aerobics,” “resistance exercise,” “exercise AND cancer survivors,” “exercise interventions AND cancer survivors,” “exercise interventions AND cancer survivors AND mechanisms,” “exercise interventions AND cancer survivors AND psychological benefits,” among other options.

3. Mechanisms of psychological benefits

The psychological advantages of exercise, as well as the coping mechanisms for cancer patients, are the result of complex and diverse mechanisms. They encompass various dimensions, including neuro-biochemistry, immunomodulation, social interaction, and self-efficacy.

3.1. Increase neurotransmitter levels

Part of the positive effect of physical activity on the psychological well-being of cancer survivors could be due to its power in influencing neurotransmitter levels in the brain, which is involved. Exercise causes the release of several neurotransmitters such as endorphins and dopamine, which play a very important role in mood regulation and pain relief as well [24,25]. Endorphins are known as natural analgesics (pain relievers), and their endogenous synthesis helps to make cancer patients feel less pain with the concurrent improvement of their mood [26]. Dopamine, on the other hand, is the key to our pleasure and reward centers; its consistently high levels are connected with better mood and increased motivation [27,28]. Moreover, exercise not only induces the production of serotonin as a response but also increases the concentrations of that neurotransmitter, which is highly critical in the easing of depressive symptoms [29]. The critical neurotransmitter serotonin is interconnected with the body’s regulation of various biological functions such as mood, sleep, and appetite. Pain-free is achieved by a physical exercise discipline, developing new serotonin levels correlated with feelings of depression and anxiety [30,31].

New research indicated that body workouts have a positive impact on our mood through the influence of neurotransmitters and the cure of their unevenness [25,32]. Individuals who engage in aerobic exercise report reduced levels of psychological stress after exercise, which may lead to improved sleep quality. These benefits are partially achieved through reduced levels of stress-related hormones such as cortisol. These observations reinforce the potential molecular targets of exercise, which can be used to regulate neurotransmitters, improve patients’ emotional states, and indirectly alleviate pain. This scientific research direction may have positive implications for the development of comprehensive treatment plans. Due to this exercise program, cancer survivors’ mental health may not only improve, but their quality of life may also significantly increase, while treatment-related side effects may decrease, and even cancer recurrence and prognosis may be positively influenced.

The new discoveries in the field of neurobiology have outlined the pathways that are affected by aerobic exercises through which depression is ameliorated. Scientific evidence shows that exercise might make depression disappear by improving the

amount of nerve growth factors in the brain, particularly the brain-derived neurotrophic factor (BDNF) [33]. BDNF is a key element in the regulation of neuron survival, differentiation, and synaptic plasticity, all linked to mood and cognitive function improvements [34]. These increases in neurotransmitter levels not only directly improve the emotional state of cancer survivors, alleviating symptoms of depression and anxiety, but also help them adapt more effectively to daily life and enhance their psychological resilience by boosting their self-confidence and sense of control. In addition, the social interaction promoted by exercise can further improve survivors' emotional health and overall mental well-being.

3.2. Immune function enhancement

The intake of appropriate exercise plays a big role in the immune activity of cancer-affected individuals, with evidence coming from lots of studies. Exercise is a way to increase the immune system's defense mechanism, resistance to disease, and also lower the risk of infection [35]. In particular, everyday physical activity helps in the multiplication and the function of immune cells circulating in the blood, even as it reinforces the cellular metal and the apparatus for the elimination of viruses and unnatural cells [36,37]. This is a unique phenomenon that could be very well associated with cancer survivors, the majority of whom often encounter a decrease in the immune system as well as an increased risk of infection after treatment. Further, common reports have suggested that physical activity results in the enlargement of natural killer (NK) cells in both quantity and activity. NK cells are instrumental to the anti-tumor immunity [38–40]. Besides, exercise affects the production of cytokines and relieves the inflammatory shock, which is essential for cancer survivors' recovery [41]. For example, Oza et al. [42] showed that correlations exist between inflammation and behavioral symptoms in survivors of breast cancer, which may be developed as a result of exercise's anti-inflammatory activity. Moreover, enhancing the effectiveness of cancer treatment by reducing cardiotoxicity and peripheral neuropathy, which in turn increases mood and quality of life [43,44].

The process of engaging in physical exercise has long been known to reduce the risks of cardiotoxicity and peripheral neuropathy in cancer patients generally, operations that eventually impact positively emotional feelings and the overall quality of life [45,46]. A good example is when McCrary et al. carried out a systematic review and meta-analysis to establish this mechanism with the help of a combination of aerobic and resistance exercises, which were seen to be good in some cancer survivors [47]. The data serve as a testament to the significant role that physical activity plays in the regulation of immune responses and the wellness of cancer survivors. In particular, exercise is deemed central in the therapy of immune responses and maintenance of health in people who have beaten cancer. Physical exercise training, on the whole, may strengthen the immune system and contribute to reversing the impacts the immune system has on the body, and so play a role in the patient's recovery.

Current exercise efficacy synthesizing achieving cancer survivors' optimal modality, exposure time, and programs still requires hospitalized and outpatient patients to play a crucial role in creating comprehensive plans for cancer survivors.

Detailed studies like those focusing on the type, frequency, intensity, and duration of exercise, and also examining the exercise applicability and efficacy to various cancer types and treatment stages, will be imperative in the successful integration of exercise interventions in the comprehensive treatment plans for cancer survivors. This research can bring about useful ideas and suggestions that will encourage clinical practitioners and researchers in these areas to enhance the exercise intervention protocols and thus get better psychological recovery and better immune function for cancer survivors.

3.3. Promoting social interaction

Physical exercise creates opportunities for cancer survivors to connect socially, therefore reducing their feelings of isolation. Participation in team or individual sports is a good way for people to meet and engage with others, develop talking and empathy skills as well as make lasting friendships based on mutual support [48]. Crucial for cancer survivors are these communicative social activities, which serve a dual purpose of helping in the provision of emotional support, reducing loneliness, and establishing a sense of social relationship [49].

Connectivity between people brings about not just their instant emotional but also their long-term cognitive well-being [50,51]. Thus, the data obtained in a study could be considered significant. Despite the relationship perceived between cancer survivors' opinions on adverse cancer-related consequences and psychological distress, the association can be mitigated if social support is present [52]. In addition, the involvement of patients in activities like dragon boat racing not only encourages them to exercise but also allows them to find out how they can contribute and look for a sense of purpose in the group [53]. Therefore, with exercise, patients recover and find their identity again through physical activity.

Subsequent research has confirmed integrated physical activities to be important both for somatic and social concerns in cancer rehabilitation. Regular walking or running not only improves your physical health but is also beneficial to emotional health [54]. It is, thus, noted that through the lack of physical health but social-emotional support is increased, which is seen as the decisive part of the comprehensive recovery of cancer survivors [55]. The real challenge, then, is to consider the social and psychological requirements of cancer survivors when creating exercise interventions. Already, an inter-generational factor amongst the patients' family, sports, and cultural perspectives, makes them recover more serenely. This mode can be the key for the survivors who are feeling hopeless feeling guilty about their illness as they are learning to navigate their reactions.

3.4. Increased self-efficacy

Physical exercise is more than just a physical activity; it is something that is associated with society first and foremost, especially among those who have survived cancer. For both people who went through cancer in pairs and those who played individual sports, they managed to widen their social circles, develop their communication skills, and build personal ties characterized by mutual support and help [56,57]. Thus, and thus positive relations have been realized in the life of these individuals. These social links represent the pathways to the mental well-being of

cancer survivors and allow them to provide emotional help, to avoid feeling that they are alone, and, last but not least, to fit into the society one sees oneself as a member.

Many studies have found that sports activities help in the bettering of support and contact between people diagnosed with cancer. For example, Galiano-Castillo et al. [58] are among those who have seen the impact of the internet-based intervention that resulted in a positive change in life quality, pain intensity, muscle force, and fatigue in breast cancer survivors. In this way, telemedicine strength training can be an efficient platform that ensures the beneficial interaction between former patients and their own support groups and the involvement of the survivor in their rehabilitation. Furthermore, Maxwell-Smith et al., during a randomized controlled trial to promote physical activity among colorectal and endometrial cancer survivors through the We Aim to Actively Prevent Physical Inactivity (WATAAP) program, discovered that social interaction was one of the most important factors contributing to the success of the intervention [59].

Increased social interaction not only enhances the emotional well-being of cancer survivors but also improves their adherence to treatment and overall quality of life [60]. Coughlin et al. [61] conducted a review on the utilization of consumer wearable devices to promote physical activity among survivors of breast, prostate, and colorectal cancers. These devices facilitate the recording and sharing of exercise data, thereby fostering social interaction and competition, which in turn enhances the enjoyment of exercise and motivation. The implementation of this technology not only increases the participation of cancer survivors in physical activities but also strengthens their psychological support systems through the expansion of social networks.

4. Individualized exercise therapy

After analyzing how exercise improves mental health by regulating neurotransmitters, improving immune function, promoting social interaction, and enhancing self-efficacy, we specifically studied exercise intervention measures and their implementation methods. These practical applications not only demonstrate how theoretical mechanisms work in real life but also provide cancer survivors with practical advice and guidance to maximize the benefits of psychological rehabilitation.

4.1. Aerobic exercise

Aerobic activities, including walking, jogging, and swimming, have been extensively researched and demonstrated to be effective in alleviating anxiety and depression, as well as enhancing the quality of life for cancer survivors [62,63]. These forms of exercise bring about a good mental situation due to increased blood circulation, blood oxygenation, and nutrient levels in the brain, supplementation, and an increase in cognitive functions. If they have cancer, they can decrease the risk of death because of it. One study referenced a sixty-three-year-old man who, despite being a smoker for many years, significantly decreased his lung cancer death rate by half only through bicycle transportation. Zhang et al. [64] studied the effects of exercise on depression and anxiety in breast cancer survivors and identified the optimal exercise regimen for this patient group. The results showed that participants

who engaged in aerobic exercise three times a week for 30 minutes each session for 12 weeks experienced significant reductions in depression and anxiety symptoms, as well as notable improvements in quality of life scores.

One study mentioned a 63-year-old man who, despite smoking for many years, reduced his lung cancer mortality rate by 50% simply by commuting by bicycle [65]. Norouzi et al. [66] found that combining Zumba dance with aerobic exercise improved working memory, motor function, and depressive symptoms in women with fibromyalgia.

The work done on the analysis of the different ways and root mechanisms of exercising aerobically on human microvascular reactivity showed that, in fact, the adaptation of the microvasculature to such exercise really helps microvascular functions. This notion is applicable to cancer patients, where metabolic flux plays a critical role in it since the latter aspect is strongly associated with microvascular dysfunction [67]. For example, it has been proved that aerobic training not only increases the blood flow into tissues, which in turn can lead to proliferation of endothelial cells and subsequent angiogenesis, but also is a way of chronic ischemic limb direct therapy of older individuals who have peripheral neoplasia. Aerobic expertism has also been reported to be a factor that can influence the CDV-positive's C-reactive protein level [68]. Aerobic exercise has also been reported as a factor that may affect C-reactive protein levels in CDV-positive patients [69,70]. Findings in the field of neurobiology have revealed that aerobic exercise can influence the resolution of depression. Regular aerobic exercise counteracts the effects of stress and depression by regulating the function of the hypothalamic-pituitary-adrenal (HPA) axis [71].

However, the intensity and duration of aerobic exercise must be adjusted according to an individual's physical condition. For some frail cancer survivors, high-intensity aerobic exercise may lead to discomfort or fatigue. Therefore, when implementing aerobic exercise interventions, personalized exercise plans must be developed, taking into full consideration an individual's physical strength and endurance. Additionally, the effects of aerobic exercise may vary depending on an individual's health status and exercise habits. Further research is needed to explore the specific effects of different intensities and types of aerobic exercise on survivors of various cancer types and treatment stages.

4.2. Resistance exercise

Resistance training, which includes activities such as weight lifting and push-ups, not only enhances muscle strength and endurance among cancer survivors but also contributes positively to psychological well-being. Muscle Strength (MSR) increases metabolism when muscles grow. This way, muscles more effectively contribute to the support and protection of bones and joints, thus ensuring a lower risk of complications associated with physical weakness [72]. In addition, it has been seen that the mental well-being of an individual is boosted with the alpractice of resistance training. Regardless of that, such people are better prepared to handle stressful situations; hence, they enjoy extra confidence.

The impact of resistance exercises on the strength of the muscles is both divergent and complicated. The studies show that this mode of training causes muscular

hypertrophy and an increase in the cross-sectional area of fibers in such a way that it is connected with the enhancement of muscle strength and endurance [73]. Such challenging of the muscle tissue also improves muscle strength. It is significant for cancer victims as it may result from the muscle mass loss that is brought about by the treatment course, causing a decrease in physical functionality. Resistance training not only counteracts muscle atrophy but also induces signals responsible for muscle growth, such as the TGF-β/muscles development blockade signaling pathway that promotes muscle protein synthesis [74].

Resistance exercise has been observed to conclusively relieve symptoms of depression and anxiety through increases in physical strength and endurance, and at the same time, the individual's self-efficacy is enhanced [75]. Besides this, resistance exercise decreases the activity of the HPA axis and subsequently cuts down on the production of the stress hormone cortisol, which is one of the factors causing chronic stress and depressive conditions [76].

Enhanced self-efficacy is closely related to the regulation of the HPA axis, which is the body's primary stress management mechanism [77]. In addition, resistance training can reduce HPA axis activity, thereby reducing the secretion of the stress hormone cortisol, which is one of the factors contributing to chronic stress and depression [78].

Furthermore, BDNF is central to these processes, responsible for the control of neurogenesis, the survival of neurons, and the plasticity of the synapses. These are the factors that have been reported to lead to improvements in mood and cognitive function [79]. Meanwhile, doing resistance training has been shown to raise BDNF levels, which is likely to result in the improvement of the regulation of mood and enhance cognitive performance [80].

However, resistance training requires proper technique and proper load to prevent muscle strain or joint damage. In addition, for some cancer survivors at risk of bone metastasis, high-intensity resistance training may increase the risk of fracture. Therefore, during the resistance exercise, the individual should be guided by a professional trainer to ensure the correct action, and the intensity of the exercise should be tailored according to the individual's health status.

4.3. Yoga

The practice of yoga, which includes physical postures, breathing techniques, and meditation, has become very popular in the psychological rehabilitation of cancer survivors. Studies have shown that yoga can promote relaxation, diminish psychological stress, and raise the total amount of life in cancer survivors. Both deep breathing and meditation have been reported to induce changes in the brain and reduce stiffness in people who work on them as part of their treatments. Also, these practices showed they have a link to strength and the quality of their sleep. Moreover, yoga, as a thought training exercise, can be used as a technique of self-regulation and emotional intelligence, which leads to the reduction of psychological stress problems like depression and anxiety.

Yoga is characterized by stress response relief through changing the HPA axis, which is the primary physiological mechanism for stress regulation. Yoga acts on the

HPA axis to reduce the release of cortisol in response to stress and thus decrease the level of cortisol and the intensity of the stress response [81]. It is also possible that yoga promotes BDNF, a key protein that determines whether or not neurons survive, differentiate, and make synaptic connections. These occurrences have been associated with the relief of both mood and metacognitive dysfunction [82].

However, yoga is the most commonly used form of complementary treatment and rehabilitation among breast cancer survivors. It has been found that the quality of life of survivors, as well as their survival rate during chemotherapy, is improved through yoga, and it also reduces fatigue and negative mood [83]. These findings put a strong emphasis on the importance of practicing yoga, while it also lays the ground for a scientific approach to applying it in the treatment of psychological rehabilitation of cancer patients. The mental health of cancer patients can be improved by yoga without concern for any side effects. It lifts the mood and promotes a state of relaxation, besides nurturing mental flexibility and patience.

The effect of yoga can vary according to individual flexibility and balance. For some cancer survivors in poor physical condition, some yoga postures may be challenging and may even lead to discomfort. Therefore, in yoga teaching, it is necessary to provide choices for different difficulty levels of posture and encourage individuals to adjust according to their physical ability. In addition, the influence of yoga practice may be influenced by cultural background and personal beliefs.

4.4. Tai chi

Tai-Chi originated from its slow, flowing movements and is accompanied by deep breathing techniques that would engage survivors of cancer to experience those benefits, which are related to their mental health. It is indicated that Tai Chi is an instrument of better sleep quality and that it reduces anxiety and depression rates for this group as well [84]. Also, this activity of sports promotes mental toughness as it helps survivors to be more aware of their bodies and master relaxation, which means they have a better way to manage their mind and cope with stress.

The effects of Tai Chi on people's mental health go beyond the line of emotional regulation. They span the horizon from emotional stability to self-efficacy being strengthened. In the study by Ester et al., which aimed to determine the feasibility and efficacy of a Tai Chi program among patients with advanced lung cancer, it turned out that Tai Chi tended to alleviate cancer symptoms and enhance patients' quality of life [85]. Moreover, as a gentle form of exercise, Tai Chi is most suitable for people who are restricted in their physical movements due to cancer therapy [86]. This kind of training brings about not only better physical performance in patients, but this also results in them feeling better as a result of the improvement in their self-efficacy and the building of a more positive attitude [87].

Tai Chi is very effective in the elimination of fatigue and redefinition of the sleep cycle to the normal state that follows the operation of the stomach for patients with gastric cancer who have recently undergone surgery [88]. The research findings reveal the various positive effects of Tai Chi in the healing of cancer survivors, namely in increasing their quality of life and ameliorating the pain caused by the treatment. Tai Chi positively influences the psychological well-being of cancer survivors by fostering

body awareness, relaxation techniques, emotional stability, and self-efficacy. Such practices not only improve the mood and overall quality of life for cancer survivors but also bolster their mental resilience and capacity to tolerate stress.

In addition, Norouzi et al. [89] found that the combination of mindfulness and exercise can effectively reduce the severity of mood disorders and insomnia in patients with major depression. This is of great significance to explore how to combine exercise with other psychological interventions to improve the overall efficacy. Takemura et al. [90] aimed to compare the effects of aerobic exercise and Tai Chi on perceptual cognitive function, as well as the mediating role of psychoneurological symptoms of perceptual cognitive impairment. The study found that Tai Chi has a positive effect on the cognitive function of advanced lung cancer survivors with impaired cognitive function. The improvement of cognitive function is achieved by reducing sleep disorders, fatigue, anxiety, and depression.

5. Practical application of sports interventions

5.1. Development of exercise therapy

The utilization of exercise therapy and clinical exercise prescription as adjunctive treatments in cancer care is progressively gaining traction. Although there is a limited number of studies examining exercise therapy for cancer patients in China, and no standardized exercise guidelines have been specifically formulated for this population, several international consensus statements and guidelines exist that offer a scientific foundation for the development of exercise prescriptions. For instance, the Nutrition and Physical Activity Guidelines for Cancer Survivors, published by the American Cancer Society, provide explicit recommendations regarding physical activity for cancer survivors [91]. These guidelines underscore the necessity of personalizing exercise prescriptions to accommodate individual variations among cancer survivors, including their medical condition, treatment stage, age, physical capacity, and other relevant factors.

Addressing the particular requirements and limitations of those who have been affected by cancer is important in exercise prescribing. For example, some patients may undergo loss of muscle mass from defeat of cancer cells, as well as reduction of cardiorespiratory fitness from their treatments, requiring us to begin exercising them at low intensities and gradually increase the pressure on them [92]. Furthermore, exercise prescriptions should also contain pre-exercise screening guidelines so that the safety and success of the goal exercise are guaranteed [93]. Moreover, the need for exercise guidelines designed specifically for patients with cancer was possible to be concluded in the consensus statement from the International Multidisciplinary Roundtable, which generated detailed recommendations stating the types, number, intensity, time, and progression of exercise [94].

To manage the goals of exercise, an exercise prescription ought to deal with the aerobic training, resistance training, and flexibility training as three main components [94]. Aerobic training improves cardiorespiratory endurance, resistance training brings about the development of strength and endurance in muscles, and flexibility training increases the range of motion while minimizing the chance of injury. Exercise prescriptions should also take into account the psychological well-being of cancer

survivors, as studies suggest that exercise can improve mood and reduce treatment-related psychological stress. Exercise prescription development shall be evidence-based and acknowledge the differences among cancer survivors. This requires a close collaboration among healthcare providers, physical therapists, and exercise specialists to ensure safe, successful, and individualized exercise programs.

Cancer survivors need to set up personalized exercise therapy. Therefore, professional nursing staff must admit that the healing effect of exercise varies greatly from person to person. Some survivors may face problems such as muscle loss and decreased cardiovascular function due to treatment, so they may need to start with low-intensity exercise and gradually increase the intensity [95]. In addition, the long-term effects of exercise therapy categories are a very important area of research. Insisting on the sustainability of exercise programs is one of the most popular research topics at present, and it needs to be treated with caution [96]. Safety is still the primary issue in the implementation of therapy. Through the doctor's assessment, the physical suitability of cancer survivors to participate in specific forms of exercise is confirmed, which has a significant impact on the entire exercise process [97]. Therefore, medical experts and researchers must systematically study the different variables of these exercise methods, assess their pros and cons, and assess their impact on emotional and physical health before implementing any exercise plan for patients.

5.2. Safety and effectiveness of exercise interventions

It is important to note that progressive resistance training (PRT) is safe and effective when performed by patients with breast cancer [98]. This sport can significantly improve life quality, reducing pain, strengthening muscles, and fatigue among breast cancer patients. Still, more research on the suitability and effectiveness of exercise interventions, especially in terms of the resistance training performed without professional supervision, is required [99]. In this aspect, telemedicine-based exercise interventions as a new approach not only became a better life-saver, but they also turned out to be effective in the treatment of pain, muscle strength, and fatigue of female cancer patients.

Telemedicine exercise interventions represent a new customer-oriented strategy that allows breast cancer survivors to engage in personalized exercise programs at their homes [100]. This strategy addresses the barriers related to the classical training on-site, such as transport issues, time limits, and so on. The use of this model not only allows for more access and convenience but also increases the level of patient compliance is increased and the overall exercise experience is improved by setting them up in a non-distractive environment and providing them with feedback [101].

Also, exercise interventions have recently become the theme of debate, as to whether they are both safe and effective. Research confirmed that dedicated exercise prescriptions produced significant gains in physical fitness and life satisfaction in patients with chronic diseases, as well as decrements in the prevalence of premature mortality, cardiovascular diseases, and other chronic conditions [102]. These discoveries reaffirm the critical position of exercise interventions in cancer care, especially in helping patients to improve the quality of life after treatment and treatment-induced side effects.

Currently, comprehensive studies on the best exercise methods, exposure time, and exercise programs for cancer survivors play a key role in the development of comprehensive treatment plans for cancer survivors [103]. A detailed study of the type, frequency, intensity, and duration of exercise, as well as an assessment of the applicability and effectiveness of exercise in different cancer types and treatment stages, is essential for the successful integration of exercise interventions into comprehensive treatment plans for cancer survivors [104].

5.3. Considerations for exercise interventions

Flexibility, progressivity, and continuity are the main elements in intervention exercises for cancer patients. It is critically important that the right activity program be modified for each cancer survivor to secure both safety and efficiency. The rate of exercise should be regularly increased so as to avoid the danger of exercise, and patients with cancer should be taught the importance of long, persistent exercise schedules in order to obtain the psychological and physiological benefits for a long time [105]. What is more, the monitoring and testing are an undeniable part of the intervention process of exercising, and these must never be disregarded. Therefore, cancer survivors should be tracked in psychological and physiological terms, and the ways of the program should also be modified if there are any new conditions [87]. The Nutrition and Physical Activity Guidelines for Cancer Survivors, developed by the American Cancer Society, are seen as the prime document among cancer survivors, whereby the individual variations among them are highly accentuated [91]. To this end, the beachhead that exercise plans include different factors is that exercise results of patients must include such characteristics as the patient's state, stages of treatment, age group of ages, physical capacity, and some other variables. In this case, patients who have been through gastrointestinal surgeries might need a specially designed exercise program that will improve the recovery period [106].

Slow increments in the intensity of workouts are the primary ways to keep the risk of workout injuries low, and at the same time, allow the patient to get used to the activity. The studies show that the proper level of intensity makes the patients' physical health better, and it's the best way to improve their quality of life [107]. Moreover, the exercising programs that have continuity matter the same as the adherence to exercise regimens; the latter is tightly connected to the former, so it means the same prolonged psychological and physiological benefits. For example, consistent participation in aerobic exercises has been shown to improve cardiorespiratory endurance and reduce the risk of chronic diseases [108]. It is of the essence that we pay attention to the mental and physiological statuses of the patients while the workout is on. The continuous monitoring of the patients' mood, pain, fatigue, and physical abilities, together with periodic and scheduled evaluations, is the key to these assessments. This way, the healthcare team will be able to make necessary changes to the training schedule so as to maximize the effects on the patients and diminish the possible risks of the process.

6. Discussion and outlook

Interventions involving movement are very successful in the recovery of people

with cancer. However, the discrepancies in intervention protocols, exercise type, frequency, and intensity across different studies have caused inconsistent results. Thus, the upcoming research ought to find and create uniform exercise programs to monitor the accurate effects of exercise on patients' health. In addition, the limited information on trials that used physical activity with psychotherapy, although there is evidence that exercise can be beneficial for mental health, is the source of the problem. The scientists should focus on the application of physical activity treatment combined with cognitive behavioral therapy, counseling, and other psychotherapeutic modalities, which aim at mental rehabilitation. To be specific, the implementation of psychological interventions with exercise therapy provides new possibilities for the improvement of mental health and the quality of life in bipolar disorder patients [109]. This joint approach may work through different means to enhance the effect of treatment on a large scale.

Most of the research work that has been done recently mainly deals with the short-term benefits of exercise in terms of psychology, while there are just a few studies that have been carried out in the long term. The long-lasting influence of persistently doing exercises on the psychological health of cancer survivors is a topic that still needs to be thoroughly investigated. For example, a meta-analysis review and a network meta-analysis of randomized controlled trials showed that the type of exercise and the duration of the training were both significantly associated with the quality of life of patients with cancers of the digestive system [110]. This fact, in turn, suggests that long-term exercise interventions may have a positive influence on cancer patients' quality of life.

Being safe is the most important factor to consider when one wants to include an exercise program in a cancer patient's rehabilitation. Some patients with cancer may suffer from a health condition preventing them from doing some of the exercises. Therefore, researchers and therapiststo check the safety and the possibility of such a treatment so that they can be sure that the patients get mental benefit without physical injury. For example, some patients who have been through gastrointestinal surgery may require a specific type of exercise program that will assist in avoiding postoperative complications and improving their recovery. In addition, the adjustment of the treatment to the patient's individual needs, the gradual increase in intensity, and the application of the exercises in a regular manner are very important with respect to both safety and efficacy.

When exploring the role of exercise intervention in the psychological rehabilitation of cancer survivors, it is necessary to note that some individuals may experience physical limitations. For survivors with limited activity due to treatment side effects or the disease itself, the exercise regimen must be appropriately adjusted. For example, low-intensity forms of exercise, such as yoga or tai chi, are recommended because they are less stressful to the body and can be performed in a limited space. Water sports are also a good choice because they can reduce the strain on joints and muscles while still providing effective exercise.

For individuals with financial means, telemedicine and community-based exercise programs provide viable alternatives. These options are usually cheaper and can be adjusted according to the individual's schedule and ability. Telemedicine platforms provide personalized exercise guidance and monitoring, while community-

based projects create a supportive environment where participants can find motivation and encouragement in a group environment. At the same time, some survivors may need to provide additional psychological support while exercising. Although physical activity can positively affect mental health, it cannot replace professional psychotherapy or drug therapy. For survivors experiencing severe depression or anxiety, exercise should be included in a comprehensive treatment plan and combined with psychotherapy and drug therapy to ensure optimal recovery.

7. Conclusion

This evaluation includes a full review of the research progress made in dealing with the psychological benefits of exercise as a therapeutic approach to the mistakes that occur in the treatment of cancer survivors. The literature evidence has shown that the acquisition of exercise interventions that enable symptom relief of anxiety and depression, life quality enhancement, and self-efficacy improvement among cancer survivors is highly necessary. However, there is still a necessity for further research on the ideal exercise regimens, the long-term effects of such interventions, as well as the integration of exercise with psychotherapy. It is vital for clinicians and researchers to take into account the individual needs of cancer survivors, create customized exercise intervention programs, and continuously improve these programs in practice. Also, getting interdisciplinary cooperation and having a strong social support system in place will be things that will help in the prevalence and effectiveness of exercise interventions, thus providing cancer survivors with complete psychological rehabilitation support.

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Availability of data and materials: This research paper presents data and materials that were gathered from scientific articles and can be found freely through the journals or databases where they were reported in the first place. The references for these studies are comprehensively listed in the bibliography of this article. No new data were generated during this review; therefore, no additional datasets or repositories are associated with this publication. For readers interested in accessing the full texts of the studies reviewed, we recommend consulting the relevant databases or contacting the authors of the original articles for further information. We have made every effort to ensure that all sources are properly cited and that the information presented in this review is accurate and up to date.

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