

Review

# Psycho-oncology and sports science: A review of the interdisciplinary approaches to enhancing quality of life in cancer patients

Jun Wang<sup>1</sup>, Hong Li<sup>2,\*</sup>

<sup>1</sup> Department of Physical Education, Guangzhou Academy of Fine Arts, Guangzhou, Guangdong 510260, China

<sup>2</sup> Department of Physical Education, Guangzhou Academy of Fine Arts, Guangzhou, Guangdong 510260, China

\* Corresponding author: Hong Li, [gzmsxytub@163.com](mailto:gzmsxytub@163.com)

## CITATION

Wang J , Li H . Psycho-oncology and sports science: A review of the interdisciplinary approaches to enhancing quality of life in cancer patients. *Psycho-Oncologie*. 2026; 20(3): 4188.  
<https://doi.org/10.18282/po4188>

## ARTICLE INFO

Received: 3 March 2025

Accepted: 2 April 2025

Available online: 31 March 31, 2026

## COPYRIGHT



Copyright © 2026 by author(s).

*Psycho-Oncologie* is published by PiscoMed Publishing Pte. Ltd. This work is licensed under the Creative Commons Attribution (CC BY) license. <https://creativecommons.org/licenses/by/4.0/>

**Abstract:** The quality of life for cancer patients has become a crucial indicator for assessing the effectiveness of treatment and the rehabilitation process. The purpose of this paper is to provide a comprehensive review of the latest research advancements in oncopsychology and exercise science aimed at improving the quality of life for cancer patients. Additionally, it seeks to explore the practical application of interdisciplinary approaches in cancer rehabilitation. Through a thorough examination of relevant literature both domestically and internationally, this paper highlights the significant role of tumor psychology in helping patients adjust their psychological state, enhance treatment compliance, and strengthen mental resilience throughout the cancer treatment and rehabilitation process. Meanwhile, advancements in exercise science research, particularly breakthroughs in aerobic exercise and resistance training, provide a scientific basis for the recovery of bodily functions in cancer patients, the alleviation of treatment side effects, and the enhancement of their quality of life. Building on this foundation, this paper emphasizes the importance of an interdisciplinary approach that integrates psychological interventions with exercise therapy to create a comprehensive, personalized rehabilitation model. This model focuses not only on the disease itself but also on the overall well-being of the patient. The purpose of this study is to offer robust theoretical support for cancer rehabilitation by conducting an in-depth analysis of the application of oncopsychology and exercise science in clinical practice. Additionally, it aims to provide new perspectives on future research directions, to maximize the quality of life for cancer patients while respecting their differences. This study seeks to contribute new knowledge and insights to the field of cancer rehabilitation.

**Keywords:** cancer patients; exercise science; interdisciplinary approach; psychology of oncology; quality of life

## 1. Introduction

Cancer, as a global health issue, has emerged as a significant challenge in contemporary society [1]. It not only poses a substantial threat to patients' lives but also severely impacts their quality of life during treatment. Despite the continuous advancements in medical technology that have significantly improved the survival rates of cancer patients, the challenge remains to extend survival while enhancing patients' quality of life. This has become a focal point in both clinical practice and research [2]. Oncopsychology is a specialized branch of psychology that addresses the mental health and psychosocial needs of cancer patients. This field involves understanding and intervening in the emotional, cognitive, and behavioral challenges that individuals face during diagnosis, treatment, and recovery [3]. The primary objective of oncopsychology is to enhance the overall quality of life by assisting patients in coping with the stresses associated with their illness and fostering

psychological resilience through comprehensive assessment and treatment. In this context, oncopsychology and exercise science, as interdisciplinary intervention methods, are playing an increasingly vital role in cancer rehabilitation. The aim of this paper is to provide a comprehensive review of these two approaches and to explore their applications and far-reaching implications for improving the quality of life of cancer patients.

Cancer treatment is often accompanied by significant side effects, including pain, fatigue, nausea, and hair loss, which can severely impact patients' daily lives [4]. Furthermore, a cancer diagnosis itself can be a profound psychological shock, leading patients to experience psychological issues such as anxiety, depression, and fear [5,6]. The field of oncology psychology specifically addresses these psychological challenges. Through targeted psychological interventions, it assists patients in adjusting their mindset and enhancing their mental resilience, ultimately improving their quality of life [7]. Simultaneously, exercise science contributes to the physiological well-being of patients through tailored exercise therapy, which enhances their self-care capabilities and further improves their quality of life [8].

This review commences with an examination of the role of psychological oncology in cancer rehabilitation. Psychological interventions encompass various forms of cognitive-behavioral therapy, psychodynamic therapy, and positive thinking meditation, all of which have demonstrated effectiveness in alleviating patients' psychological burdens and enhancing their coping mechanisms in the face of cancer [9]. Research indicates that these psychological interventions can significantly reduce levels of anxiety and depression among patients, while also bolstering their confidence in treatment, ultimately leading to improved treatment adherence [10]. Furthermore, these interventions facilitate the establishment and maintenance of social support networks, which are crucial for mitigating feelings of loneliness and enhancing overall quality of life [11].

This review examines the role of exercise science in cancer rehabilitation. Exercise therapy encompasses aerobic exercise, resistance training, and flexibility exercises. These modalities can enhance patients' physical fitness, increase muscle strength, and improve cardiorespiratory fitness, ultimately leading to a better quality of life. Research has shown that regular exercise can alleviate cancer-related fatigue, improve sleep quality, and mitigate treatment-induced physical dysfunction [12]. Furthermore, exercise therapy can help regulate patients' emotions, reduce depressive symptoms, and enhance overall life satisfaction [13].

This paper further analyzes an interdisciplinary approach that integrates oncology, psychology, and exercise science. This comprehensive intervention model fully considers the psychological and physiological needs of patients. By leveraging the synergistic effects of psychological support and physical exercise, it aims to enhance the overall quality of life for patients. Empirical studies have demonstrated that interdisciplinary interventions can more effectively improve the physical and mental well-being of cancer patients, enhance their quality of life, and may even positively influence treatment outcomes.

Finally, this paper proposes directions for future research. Firstly, there is a need for more high-quality clinical trials to validate the effectiveness of interdisciplinary interventions in cancer rehabilitation. Secondly, researchers should concentrate on personalizing interventions and developing tailored intervention plans based on patients' specific conditions. Additionally, the application of emerging technologies in interdisciplinary interventions, such as artificial intelligence and telemedicine, should

be explored to enhance the convenience and accessibility of these interventions. In conclusion, the fields of oncology psychology and exercise science play a crucial role in enhancing the quality of life for cancer patients. By thoroughly exploring the application of these two disciplines, we aim to offer more comprehensive and effective support for cancer rehabilitation, assisting patients in better coping with their illness and enjoying an improved quality of life.

## **2. Methods**

Literature searches were conducted using PubMed, Google Scholar, Elsevier ScienceDirect, and Web of Science. The search strategy employed the following terms: “psychology of oncology,” “oncopsychology,” “exercise science,” “cancer,” “tumor,” “cancer patients,” “quality of life,” “psychological intervention,” “physical exercise,” “oncopsychology AND exercise science,” “cancer patients AND quality of life,” “oncopsychology AND cancer patients,” and “exercise science AND cancer patients,” “oncopsychology AND exercise AND cancer patients AND quality of life,” among others.

### **2.1. The role of psycho-oncology in improving the quality of life of cancer patients**

#### **2.1.1. Overview of psychological interventions**

Psychological interventions play a crucial role in psycho-oncology, encompassing a range of structured and intentional psychotherapeutic approaches aimed at assisting cancer patients and their families in managing the psychological challenges associated with the disease [14]. Psychological intervention refers to the application of psychological theories and techniques to systematically influence and modify an individual’s mental state and behavior. In cancer rehabilitation, psychological interventions encompass cognitive behavioral therapy (CBT), psychodynamic therapy, positive thinking meditation, and various other approaches. These interventions aim to alleviate patients’ psychological burdens, such as anxiety, depression, and fear, enhance their coping abilities, improve treatment adherence, and facilitate the development of social support networks [15].

CBT effectively reduces emotional and behavioral issues by assisting patients in identifying and altering irrational thought patterns [16]. In contrast, psychoeducation offers valuable cancer information and enhances the disease management skills of both patients and their families. Emotional support plays a crucial role in helping patients navigate cancer-related emotions through active listening and empathy [17]. Additionally, positive thinking meditation teaches patients techniques to alleviate stress and enhance emotional regulation [18]. A systematic evaluation and network meta-analysis of patients with gastrointestinal cancer demonstrated that psychotherapeutic interventions significantly reduced anxiety and depression levels while improving treatment adherence [11]. In particular, CBT proved effective in altering patients’ irrational beliefs about their disease and treatment, thereby diminishing negative emotions and promoting healthier thinking patterns.

The theoretical foundations of psychological interventions are extensive and varied, encompassing psychodynamic theory, cognitive-behavioral theory, the biopsychosocial model, and human development theory [19]. Psychodynamic theory examines subconscious motivations and conflicts, while cognitive-behavioral theory highlights the influence of cognitive structures on emotions and behaviors.

The biopsychosocial model takes into account the patient's overall environment, and human development theory addresses the impact of cancer on individual developmental tasks.

Through an in-depth exploration of psychological interventions, we find that these methods play a crucial role at various stages of cancer treatment. From providing emotional support during the diagnostic phase to offering coping strategies throughout the treatment period and facilitating psychological adjustment during recovery, psychological interventions have demonstrated significant effectiveness in enhancing the quality of life for cancer patients. As research continues to advance, the methods and theoretical foundations of psychological intervention have been continuously refined and improved, offering robust scientific support for the comprehensive recovery of cancer patients. This underscores the indispensable value of psychological interventions in clinical practice.

### **2.1.2. Psychological interventions to reduce patients' psychological burden**

Psychological interventions have a particularly significant impact on anxiety and depression. Numerous studies have demonstrated that psychological interventions, such as CBT, are effective in reducing anxiety and depressive symptoms in cancer patients, thereby enhancing their psychological resilience [20]. CBT not only diminishes the emergence of negative emotions but also fosters the development of positive thinking patterns by assisting patients in identifying and challenging irrational beliefs about their illnesses and treatments. A systematic evaluation and network meta-analysis conducted by Chen et al. [10] on patients with gastrointestinal cancer demonstrated that psychotherapeutic interventions significantly reduced anxiety and depression levels while improving treatment adherence. Furthermore, positive thinking meditation and emotional support have been shown to alleviate psychological stress and enhance emotional well-being. These interventions improve patients' resilience by guiding them to focus on the present moment and to accept, rather than resist, the emotions associated with their illness [21].

Psychological interventions play a crucial role in alleviating fear and uncertainty among cancer patients. When confronted with a cancer diagnosis and its treatment, patients often experience significant fear and uncertainty. These emotions not only profoundly impact their quality of life but may also influence treatment adherence and disease prognosis [22]. Psychoeducation serves as an effective intervention by helping patients establish realistic expectations and mitigate the fear associated with uncertainty. By providing comprehensive information about the disease and the treatment process, psychoeducation enhances patients' confidence in their treatment [23]. Additionally, techniques such as psychodynamic therapy can explore patients' attitudes toward illness and death, assisting them in addressing deep-seated fears and anxieties. This therapeutic approach facilitates their exploration of life's meaning and the reconstruction of their self-identity [24].

### **2.1.3. Psychological interventions to improve patient adherence to treatment**

Treatment adherence, defined as the extent to which patients follow medical advice regarding their treatment—including compliance with medication, dietary and exercise recommendations, and participation in regular checkups—is typically assessed using various methods, such as self-reporting, blood level testing of medications, and electronic monitoring. These approaches aim to accurately quantify patient compliance with the treatment plan [25]. Psychological interventions play a crucial role in this process. Through psychoeducation, patients gain a deeper

understanding of the importance and necessity of their treatment, which, in turn, enhances their intrinsic motivation to adhere to it [26]. Interventions such as CBT can effectively assist patients in identifying and overcoming barriers to treatment, such as irrational fears of side effects or negative perceptions related to treatment, thereby mitigating the impact of these factors on adherence [27]. The results of a study conducted by Cincidda et al. on psychological interventions for cancer patients indicated that those who received such interventions experienced significant improvements in treatment adherence [28]. For instance, patients who underwent psychoeducation demonstrated a greater understanding of and trust in their treatment regimen, leading to a reduction in treatment interruptions and nonadherence by approximately 30%. Additionally, emotional support therapy can significantly enhance patients' self-efficacy by providing emotional comfort and encouragement, which helps them feel more confident in managing the challenges associated with their treatment.

Several studies have demonstrated that psychological interventions effectively improve treatment adherence by enhancing patients' psychological resilience, emotional well-being, and social support networks [29]. This enhancement not only contributes to better clinical outcomes, such as reduced recurrence rates and improved survival but may also decrease the waste of healthcare resources associated with treatment nonadherence. Therefore, psychological interventions in cancer treatment should not be viewed merely as adjuncts; rather, they should be integrated as a core component of the overall treatment strategy.

#### **2.1.4. Psychological interventions to promote social support for patients**

Theoretical models of social support, such as Uznadze's stress buffer model [30] and Cox's social support theory [31], highlight the protective role of social relationships in an individual's response to stressful events. These models suggest that social support can significantly reduce psychological stress and improve an individual's capacity to cope with illness by offering emotional assistance, informational feedback, and material aid. Psychological interventions are essential in this process, providing a platform for patients to articulate their emotions and experiences through various methods, including group psychotherapy, family systems therapy, and peer support programs. A study of lung cancer patients revealed that those who received psychological interventions reported significantly higher levels of social support and significantly lower levels of loneliness and social isolation [32]. Patients who participated in group psychotherapy established new social connections and expanded their social networks by approximately 40% during the treatment period. Additionally, these interventions facilitate connections between patients and their family members, friends, and fellow patients [33]. By enhancing communication skills and strengthening the ability to establish and maintain social relationships, these interventions effectively expand patients' social support networks.

Enhanced social support is closely linked to improved quality of life, treatment adherence, and survival rates among cancer patients [34]. Psychological interventions play a crucial role in enhancing patients' psychological well-being and overall quality of life by fostering social integration and alleviating feelings of loneliness and isolation [35]. Furthermore, these interventions help family members better understand the needs of patients, thereby improving the efficiency and quality of family support [36]. Consequently, integrating social support into psychological interventions has significant implications for the overall recovery of cancer patients.

## **2.2. The role of exercise science in improving the quality of life of cancer patients**

### **2.2.1 Sports and exercise**

Exercise, as a multidimensional intervention, can be systematically categorized based on its intensity, frequency, duration, and type [37]. Specifically, it encompasses aerobic exercise (e.g., brisk walking, running, swimming), resistance training (e.g., weight lifting, push-ups), flexibility training, and balance training [38]. The principles for implementing these exercise regimens emphasize individualization, gradual progression, and prioritizing safety. This approach aims to ensure that patients participate in appropriate and effective physical activities tailored to their specific conditions and physical capabilities. Exercise science is the study of the physiological, psychological, and mechanical principles of the human body during physical activity. It examines the relationship between exercise and health, as well as the role of exercise in disease rehabilitation. In the context of cancer rehabilitation, exercise science offers a scientific foundation for guiding patients in engaging in suitable physical activities aimed at restoring bodily functions, alleviating treatment side effects, and enhancing overall quality of life.

In recent years, the importance of exercise in cancer rehabilitation has become increasingly evident. Numerous studies have confirmed that regular exercise offers multiple benefits for cancer patients. It can significantly enhance patients' physical function and alleviate treatment-related side effects such as fatigue, muscle atrophy, and joint stiffness [39]. Aerobic exercise is a continuous, rhythmic activity aimed at improving cardiorespiratory fitness and increasing maximum oxygen uptake. Aerobic exercise improves cardiovascular health by enhancing cardiorespiratory fitness, thereby boosting the overall fitness of patients. Common aerobic exercises include brisk walking, running, swimming, and cycling. For cancer patients, engaging in aerobic exercise can enhance cardiorespiratory function, reduce fatigue, and improve endurance, enabling them to better manage daily activities and the treatment process. Meanwhile, resistance training helps to maintain and increase muscle strength, preventing muscle loss, which is particularly crucial for cancer patients. Resistance training is a type of exercise that enhances muscle strength, endurance, and size by overcoming external resistance. It typically includes exercises performed with free weights, resistance bands, fitness equipment, and other modalities. In cancer rehabilitation, resistance training plays a crucial role in preventing and reversing muscle atrophy and strength loss caused by the disease or its treatment. Additionally, it improves the patient's physical function and their ability to perform daily self-care activities. Additionally, flexibility and balance training play a vital role in improving patient mobility and reducing the risk of falls [40]. Flexibility training is designed to enhance the range of motion in the joints and the muscles' ability to stretch. This type of training typically includes a variety of stretches and exercises, such as yoga. For cancer patients, flexibility training can help alleviate joint stiffness and muscle tension, improve mobility and balance, reduce the risk of falls, and enhance overall physical function and quality of life.

More importantly, exercise has been shown to significantly enhance patients' psychological well-being, reduce anxiety and depressive symptoms, and improve overall quality of life [41]. As a natural mood enhancer, exercise serves as an effective psychological intervention by promoting the release of endorphins [42]. Therefore, incorporating exercise into cancer rehabilitation programs not only aids patients in recovering their physical functions but also fosters comprehensive psychosocial

recovery, achieving a harmonious balance between physical and mental health.

### **2.2.2. Exercise improves patients' physiological function**

Exercise has a particularly significant impact on cardiorespiratory function. Aerobic activities such as cycling, swimming, and jogging effectively increase a patient's maximum oxygen uptake and enhance the heart's pumping efficiency, thereby improving overall circulatory and respiratory function [43]. This is not only beneficial for cancer patients in alleviating dyspnea that may occur during treatment, but it also enhances their ability to perform daily activities.

The influence of exercise on muscle strength and endurance constitutes a critical aspect of exercise rehabilitation. Patients undergoing cancer treatment often experience muscle atrophy and a reduction in strength. Engaging in regular resistance exercises, such as weight lifting and training with elastic bands, can promote muscle protein synthesis, resulting in increases in both muscle size and strength [44]. Empirical research has shown that even mild resistance exercises can significantly improve muscle strength and endurance in cancer patients, which is essential for enhancing quality of life, reducing treatment interruptions, and facilitating recovery [45]. Teplinsky et al. examined data on the effectiveness of home exercise programs for breast cancer patients undergoing neoadjuvant chemotherapy. The study found that patients who participated in the exercise intervention demonstrated significant improvements in cardiorespiratory function [46]. After 12 weeks of aerobic exercise training, the patients increased their maximal oxygen uptake by approximately 15% and enhanced their heart pumping efficiency by about 10%. Collectively, exercise regimens offer physiological support to cancer patients by improving cardiorespiratory function and muscle strength, thereby enhancing their tolerance to treatment. These physiological advancements not only directly improve patients' capacity to perform daily activities but also indirectly contribute to positive changes in their psychological well-being.

### **2.2.3. Exercise relieves patients' psychological symptoms**

The potential of exercise as an effective intervention for alleviating psychological symptoms in cancer patients has been extensively documented in the literature [47]. The mechanisms through which exercise influences mood regulation are intricate and multifaceted, extending beyond the mere promotion of neurotransmitter release, including serotonin and dopamine, within the central nervous system. The equilibrium of these neurotransmitters is crucial for sustaining a normative emotional state [48]. Furthermore, exercise has been shown to modulate the activity of the hypothalamic-pituitary-adrenal (HPA) axis by reducing cortisol levels, which contributes to the mitigation of stress-related psychological symptoms [49]. Additionally, exercise may enhance mood and diminish pain perception by increasing the levels of endogenous opioid peptides in the brain, such as  $\beta$ -endorphin [50]. Henriksson et al. investigated whether a 12-week exercise intervention of varying intensity could reduce anxiety symptoms in patients with anxiety disorders [51]. They recruited 286 patients from primary care in Sweden. Symptom severity was self-assessed using the Beck Anxiety Inventory (BAI) and the Montgomery-Åsberg Depression Rating Scale (MADRS-S). Participants were randomly assigned to one of two exercise programs, which included cardiorespiratory and resistance training, or to a control group receiving standard non-exercise treatment, in a 1:1:1 ratio. Patients in both exercise groups demonstrated greater improvement in anxiety and depressive symptoms compared to the control group.

Regular motor exercise has been demonstrated to enhance cognitive function by promoting brain plasticity, which includes the formation of increased connections between neurons and the generation of new nerve cells [52]. These neurobiological changes may elucidate the observed improvements in attention, memory, and executive function among cancer patients who engage in aerobic exercise. Furthermore, exercise has been shown to enhance sleep quality, a factor that is equally essential for maintaining cognitive function and emotional stability [53,54]. Enhanced sleep quality may represent an additional mechanism through which exercise can mitigate psychological symptoms.

Subsequent research has demonstrated that exercise regimens significantly enhance patients' self-efficacy, defined as an individual's confidence in their capacity to perform specific tasks [55]. This augmentation of self-efficacy enables patients to more effectively manage the challenges associated with cancer, thereby alleviating psychological distress. Furthermore, participation in group exercise activities fosters social support and mitigates feelings of isolation among patients, both of which are crucial for the preservation of mental health [56]. Exercise and sports, as a form of non-pharmacological intervention, exhibit a range of benefits in mitigating psychological symptoms among cancer patients. This approach not only enhances mood and cognitive functions through various biological mechanisms but also offers holistic psychological support by fostering self-efficacy and facilitating social connections among patients.

#### **2.2.4. Exercise improves patient quality of life**

In the comprehensive management of cancer rehabilitation, exercise has emerged as a significant non-pharmacological intervention that enhances patients' quality of life [57]. Quality of life is a multidimensional concept that encompasses an individual's health status and satisfaction across physical, psychological, social, and environmental dimensions. In cancer rehabilitation, the assessment of quality of life not only emphasizes the patient's survival time but also considers their overall health experience and sense of well-being throughout the treatment and rehabilitation process. Enhancing quality of life is a crucial goal of cancer rehabilitation, aiming to assist patients in restoring normal social, work, and daily life functions as much as possible while minimizing the impact of the disease and its treatment on their everyday lives.

The beneficial effects of exercise on daily functioning are evident at various levels. Through structured training focused on muscular strength and endurance, patients exhibit improved efficiency and capability in executing fundamental daily activities, such as ambulation, ascending stairs, and rising from a seated position [58]. This enhancement in physical functioning not only alleviates patients' frustration associated with physical limitations but also fosters greater autonomy, thereby psychologically mitigating the sense of helplessness often induced by the disease. Ji et al. conducted a non-blinded, parallel-group randomized controlled trial at a public medical center in a rural community in South Korea [59]. Eligible older adults with functional sarcopenia were randomly assigned to either the intervention group, which participated in a 12-week group exercise and nutritional support program, or the control group, which received lifestyle management education. The outcomes measured included changes in gait speed, grip strength, physical functioning, and quality of life index. The results of the trial demonstrated that the 12-week exercise and nutrition intervention significantly improved physical functioning, grip strength,

and quality of life in community-dwelling older adults with functional sarcopenia. This suggests that commonly recommended strategies for treating sarcopenia, such as exercise and nutritional support, can also be beneficial for individuals with functional sarcopenia, indicating the potential for broader application of these interventions.

Furthermore, flexibility training in sports is instrumental in maintaining and enhancing the range of motion in patients' joints. This is particularly significant for alleviating stiffness and discomfort associated with prolonged bed rest or decreased physical activity [60]. The resultant physical comfort is closely linked to emotional well-being, thereby contributing positively to patients' emotional states and overall life satisfaction [61]. Additionally, from a social functioning perspective, exercise fosters social interaction and community engagement by improving patients' physical fitness and self-esteem, which are critical for the reconstruction of their social networks and support systems.

In the evaluation of the quality of life scales, numerous studies have indicated that exercise exerts a positive influence on various dimensions of instruments such as the Functional Assessment of Cancer Therapy-Fatigue (FACT-F) and the European Organization for Research and Treatment of Cancer Quality of Life Questionnaire (EORTC QLQ-C30) [62–64]. Importantly, exercise has been shown to not only improve patients' physical condition and reduce fatigue but also to significantly enhance their role functioning and overall perceived quality of life. These enhancements may be attributed to the physiological effects of exercise, which include the promotion of endorphin release, a reduction in inflammatory markers, and an improvement in immune system function.

Exercise and sports play a multifaceted role in enhancing the quality of life for cancer patients. They not only improve patients' physical functioning through physiological mechanisms but also contribute to their overall well-being via psychological and social avenues [65,66]. Consequently, it is essential to incorporate exercise as a fundamental component of cancer rehabilitation programs. This inclusion aims to deepen the understanding of the relationship between exercise and improvements in quality of life, to investigate the effects of various exercise modalities, frequencies, and durations on different dimensions of quality of life, and to develop targeted exercise intervention strategies tailored to specific cancer types and patient populations.

## **2.3. Interdisciplinary approaches in cancer rehabilitation**

### **2.3.1. A combination of psychological interventions and exercise**

The integration of psychological interventions with exercise and physical activity has emerged as a significant model in the comprehensive management of cancer rehabilitation [67]. The empirical foundation for this approach is expanding, with numerous studies indicating that the combination of these two modalities can yield synergistic effects that enhance recovery outcomes for cancer patients across multiple dimensions [68]. Specifically, this integrated intervention not only alleviates psychological symptoms, such as depression and anxiety but also improves patients' physical functioning and mitigates treatment-related side effects, including fatigue and muscle atrophy. Ilie et al. evaluated the effectiveness of a 6-month online family intervention that provided physical, psychological, and social support, known as the Prostate Cancer Patient Empowerment Program (PC-PEP) [69]. This program was designed to prevent psychological distress in men undergoing treatment for curative prostate cancer. The results indicated that PC-PEP, when implemented early

after diagnosis, significantly reduced the burden of psychological distress in men receiving treatment for prostate cancer compared to standard care or interventions initiated later (after 6 months). Furthermore, research indicates that the effects of this combined strategy are not merely additive; rather, they exert a more profound influence through interactive mechanisms. For instance, psychological interventions may bolster patients' adherence to exercise by enhancing their mental resilience, which, in turn, may positively affect their emotional well-being through the release of neurotransmitters such as endorphins [70]. This bidirectional interaction offers a more holistic support system for the rehabilitation of cancer patients.

The individualized design of intervention programs is essential when implementing combined strategies. This necessitates that healthcare professionals possess interdisciplinary knowledge and skills to effectively tailor rehabilitation programs to the specific disease characteristics, treatment history, personal preferences, and living environments of patients [71]. Furthermore, the implementation of incorporation strategies demands flexibility and adaptability to address the various changes that may arise during the rehabilitation process of the patient [72]. To ensure the efficacy of interventions, research should investigate best practices for integrating different types of psychological interventions with motor exercise. For instance, examining the model of positive thinking meditation in conjunction with aerobic exercise, or evaluating the effectiveness of group psychotherapy alongside resistance training. Lastly, long-term follow-up studies are imperative for understanding the enduring effects of such integrated intervention strategies [73]. Through long-term follow-up, it becomes possible to assess the sustained impact on a patient's quality of life and to determine whether these strategies can mitigate the risk of cancer recurrence.

In conclusion, the integration of psychological interventions and exercise within cancer rehabilitation exemplifies advancements in rehabilitation medicine and offers a comprehensive and effective rehabilitation pathway for patients. Future research should focus on further elucidating this strategy, optimizing the interventions, and validating their efficacy across a broader spectrum of clinical practices. The ultimate goal is to provide more scientifically grounded and personalized guidance for the rehabilitation of cancer patients.

### **2.3.2. Personalized rehabilitation programme**

The design principle of a personalized rehabilitation program represents not only a theoretical innovation but also a significant advancement in the practice of cancer rehabilitation. The concept of patient-centeredness necessitates that, when developing a rehabilitation program, one must consider not only fundamental biological characteristics such as age, gender, and cancer type but also the long-term effects of the patient's treatment history on their physiological and psychological state. Furthermore, it is essential to conduct an in-depth exploration of the dynamic changes in physical function [74]. Additionally, the evaluation of the social support system is of paramount importance, as it is directly associated with the patient's psychological well-being and social adaptation [75]. Minnella et al. retrospectively analyzed data that had been collected prospectively from August 2018 to December 2019 to describe the clinical implementation of a surgical rehabilitation care program for elective lung cancer [76]. The results demonstrated significant improvements in rehabilitation outcomes and quality of life for patients who participated in a personalized rehabilitation program. Consequently, an individualized program that adjusts the intensity and type of exercise according to the patient's physical

fatigue and endurance led to notable enhancements in both physical function and psychological well-being. Collectively, these factors constitute the foundation of an individualized rehabilitation program, thereby ensuring a high degree of personalization in interventions and flexibility in practice.

The implementation of an individualized program necessitates that comprehensive patient assessment be regarded not merely as an initial step, but as an ongoing process. This approach demands a high level of sensitivity and professionalism from the healthcare team to effectively identify changes in the patient's needs promptly, thereby allowing for appropriate adjustments to the rehabilitation program [77]. For instance, through regular psychological assessments, it is possible to detect potential symptoms of anxiety or depression in patients, enabling timely psychological interventions [78]. Regarding exercise regimens, the personalized program will progressively modify the intensity and type of exercise following the patient's fitness level, thereby facilitating the recovery of their physiological functions.

A multidimensional approach should be employed when evaluating the effects of personalized rehabilitation programs. This approach encompasses not only traditional quantitative indicators, such as quality of life questionnaires and physical fitness assessments but also integrates more nuanced qualitative evaluations, including patients' life diaries and in-depth interviews [79,80]. The qualitative data obtained from these methods offer researchers valuable insights into patient experiences, thereby enhancing our understanding of the actual impact of rehabilitation programs from the patients' perspective. In conclusion, the design and implementation of personalized rehabilitation programs exemplify a comprehensive care model for cancer patients, highlighting the significance of individual differences and demonstrating a commitment to delivering more humanized and scientifically grounded rehabilitation services.

#### **2.4. Multidisciplinary teamwork**

Multidisciplinary teamwork in healthcare involves professionals from various backgrounds collaborating to deliver comprehensive and integrated care to patients. In the context of cancer rehabilitation, multidisciplinary teams typically consist of oncologists, psychologists, rehabilitation therapists, dietitians, nurses, and social workers. By fostering effective communication and collaboration among team members, a holistic treatment and rehabilitation program can be designed to address patients' medical, psychological, social, and other needs, ultimately enhancing rehabilitation outcomes and patient satisfaction [81–83]. The multidisciplinary teamwork model not only aided patients in restoring their physical function but also enhanced their social adaptation. For instance, through effective communication and collaboration among team members, patients received comprehensive care both before and after treatment, resulting in a significant increase in treatment satisfaction [84].

In clinical practice, the efficacy of the multidisciplinary teamwork model has been substantiated through numerous case studies. For instance, a study focusing on the rehabilitation of breast cancer patients demonstrated that this model not only facilitates significant recovery of patients' physical functions but also yields favorable outcomes in terms of psychosocial adaptability. Effective communication and collaboration among team members ensured that the treatment program was both comprehensive and targeted, thereby significantly enhancing the overall satisfaction and quality of life of the patients [85,86]. A notable advantage of this collaborative

model is its capacity to dynamically adjust treatment strategies following the specific circumstances of each patient, thereby optimizing individualized treatment.

The significance of multidisciplinary teamwork in cancer rehabilitation is paramount and should not be overlooked [87]. This approach fosters a comprehensive rehabilitation support system by amalgamating the expertise and competencies from various professional disciplines. Future research should investigate strategies to further optimize the teamwork process, such as enhancing overall effectiveness through the establishment of standardized operating procedures, bolstering professional training among team members, and improving the efficiency of information dissemination. Additionally, studies should concentrate on identifying and addressing the complex rehabilitation needs of cancer patients with greater precision through multidisciplinary collaboration. This includes, but is not limited to, psychological support, functional recovery, nutritional intervention, and social adaptation. The multidisciplinary teamwork model offers substantial support for cancer rehabilitation, and its value and potential have been thoroughly recognized in clinical practice. Ongoing research and innovation will facilitate a deeper understanding and application of this model, ultimately leading to the provision of more efficient and patient-centered rehabilitation services for individuals affected by cancer.

### **3. Discussion**

#### **3.1. Emerging technologies in psychological oncology and exercise science**

In recent years, digital technologies, including Internet-based CBT, virtual reality exposure therapy, and mobile health applications, have emerged as prominent areas of research in psychological interventions [88]. These technologies facilitate the management of psychological symptoms, such as anxiety and depression, by offering convenient and personalized support, thereby effectively addressing the temporal and spatial limitations associated with traditional face-to-face therapy [89,90]. For instance, Internet-based CBT has been shown to significantly alleviate depressive symptoms and enhance the quality of life for cancer patients [91].

The utilization of wearable devices in the domains of exercise monitoring and rehabilitation is of significant importance. These devices offer precise data support for both patients and medical professionals by continuously tracking various physiological indicators, including activity levels, heart rate, and sleep quality [92]. The provision of real-time data feedback enables medical teams to develop and modify exercise rehabilitation programs with greater accuracy, thereby ensuring that patients can safely and effectively attain their exercise objectives [93]. Furthermore, the increasing prevalence of wearable devices has improved patients' self-management capabilities and fostered their adherence to healthy behaviors, ultimately enhancing overall rehabilitation outcomes [94].

The convergence of emerging technologies has significantly transformed the domains of oncology, psychology, and exercise science. The integration of digital therapies and wearable devices has facilitated the development of more intelligent and personalized solutions for the rehabilitation of cancer patients. Future research should focus on investigating the effectiveness and feasibility of these technologies within clinical practice, particularly in terms of their specific contributions to enhancing treatment adherence, improving psychological well-being, and augmenting physical function. Concurrently, researchers need to explore strategies for the effective integration of these innovative technologies into the existing rehabilitation framework, thereby achieving a comprehensive enhancement of the overall

rehabilitation experience for cancer patients and fostering a more profound impact on the field of cancer rehabilitation.

This article reviews the contributions of psychology and exercise science to oncology and cancer rehabilitation, exploring the practical applications, challenges, and future research directions of an interdisciplinary approach. Psychological oncology provides support to patients through various psychological interventions, while research in exercise science demonstrates that physical activity is crucial for enhancing physical function, alleviating treatment side effects, and improving survival rates. The integration of these two fields establishes a comprehensive, multidimensional treatment strategy that optimizes patients' ability to cope with cancer. A study of pancreatic cancer patients found that those who received an exercise intervention combined with psychological support demonstrated significant improvements in their quality of life [95]. After 16 weeks of exercise training and regular psychological counseling, patients' scores in physical functioning, role functioning, and overall quality of life increased by approximately 20%, 15%, and 18%, respectively. This indicates that the combination of exercise and psychological interventions can holistically enhance patients' quality of life, improving not only physical functioning but also psychological well-being.

### **3.2. Future research directions for interdisciplinary approaches**

Personalized medicine, which utilizes genomics, bioinformatics, and other advanced technological tools, provides a customized recovery plan for each cancer patient. This approach signifies a substantial shift from traditional methods, offering a more precise and effective treatment strategy [96,97]. Future research will focus on the application of big data and artificial intelligence to perform comprehensive analyses of patients' genetic profiles, disease characteristics, and treatment responses, to achieve truly individualized treatment. Specifically, researchers will explore how these technologies can clarify the molecular mechanisms underlying cancer, thereby facilitating the delivery of more targeted pharmacological therapies and personalized lifestyle recommendations for patients. Adopting a multidisciplinary teamwork model that integrates experts from various fields, including oncology, psychology, and rehabilitation medicine, has significantly improved patients' speed of recovery and quality of life. This approach reduces psychological stress during treatment, accelerates the recovery of bodily functions, and increases treatment satisfaction by approximately 35% [98]. By ensuring that patients receive comprehensive care and support at every stage of their treatment, this collaborative model enhances recovery outcomes.

Furthermore, conducting cost-effectiveness analyses of interdisciplinary approaches is crucial for ensuring the sustainability and universal accessibility of rehabilitation interventions [99]. Future research should thoroughly evaluate the economic implications of personalized medicine and interdisciplinary collaboration at both long-term and macroeconomic levels. This evaluation should encompass both direct and indirect cost savings resulting from reduced hospital stays, decreased complication rates, and enhanced quality of life. Such analyses necessitate not only the judicious allocation of healthcare resources but also a holistic consideration of patients' quality of life and the potential ramifications for the healthcare system as a whole. For instance, by examining the cost-effectiveness disparities between personalized medical interventions and traditional standardized treatments, researchers can provide robust data to support medical decision-making.

Future research directions in interdisciplinary approaches will focus on advancing the implementation of personalized medicine in cancer rehabilitation and

optimizing resource allocation through cost-benefit analysis to improve the overall efficacy of rehabilitation interventions. Research has shown that utilizing big data to analyze information about cancer patients can result in more precise treatment planning and enhanced recovery outcomes. By integrating data on patients' genetic profiles, treatment responses, and lifestyles, researchers were able to create tailored rehabilitation programs for each individual, leading to an average improvement in treatment outcomes of approximately 17%. This underscores the vital role of big data in facilitating personalized cancer rehabilitation [100]. These studies will furnish policymakers, healthcare providers, and patients with a critical foundation for decision-making, to maximize the benefits and accessibility of cancer rehabilitation services. Consequently, this will pave the way for enhancing the quality of survival and rehabilitation outcomes for individuals affected by cancer.

#### **4. Conclusion**

In this review, we summarize the contributions of oncopsychology and exercise science within the domain of cancer rehabilitation. We explore the practical applications of interdisciplinary approaches, and the challenges they encounter, and provide a prospective outlook on future research directions. The field of oncology psychology offers effective psychological interventions and support to patients by elucidating the role of psychosocial factors in the processes of cancer onset, progression, and recovery. This not only significantly enhances patients' psychological adaptability but also markedly improves their quality of life. Concurrently, research in exercise science has demonstrated, through numerous empirical studies, the critical role of physical activity in enhancing patients' physical function, mitigating treatment side effects, and improving survival rates. The integration of these two disciplines yields a comprehensive, multi-faceted treatment strategy for cancer rehabilitation. The practical implementation of interdisciplinary approaches presents several challenges. Barriers to inter-professional communication, unequal distribution of resources, and the absence of standardized assessment criteria are significant obstacles that must be addressed. However, with the ongoing advancement and refinement of the multidisciplinary teamwork model, these challenges are progressively being mitigated, leading to the development of more integrated and personalized rehabilitation programs for patients.

Looking ahead, research must continue to enhance the understanding of the interactions between oncopsychology and exercise science within the context of cancer rehabilitation. This endeavor aims to facilitate the development of more precise and personalized healthcare programs. Concurrently, the execution of large-sample, long-term follow-up studies will be instrumental in validating the cost-effectiveness of interdisciplinary interventions, thereby providing a more robust evidence base for clinical practice. Furthermore, researchers should actively investigate the application of emerging technologies in cancer rehabilitation, including artificial intelligence and digital therapies. The integration of these technologies is anticipated to yield more efficient and accessible rehabilitation services for patients. Through persistent efforts and innovative explorations, significant breakthroughs in cancer rehabilitation are expected, ultimately enhancing the quality of life for patients.

**Institutional review board statement:** Not applicable.

**Informed consent statement:** Not applicable.

**Availability of data and materials:** The data and materials utilized in this review

article are sourced from previously published studies and are publicly accessible through the respective journals or databases where they were originally reported. 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.

**Conflict of interest:** The authors declare no conflict of interest.

## References

1. Middleton G, Robbins H, Andre F, et al. A state-of-the-art review of stratified medicine in cancer: towards a future precision medicine strategy in cancer. *Annals of Oncology*. 2022; 33(2): 143-157. doi: 10.1016/j.annonc.2021.11.004
2. Suarez-Almazor M, Pinnix C, Bhoo-Pathy N, et al. Quality of life in cancer care. *Med*. 2021; 2(8): 885-888. doi: 10.1016/j.medj.2021.07.005
3. Holmes PS, Wright DJ. Motor cognition and neuroscience in sport psychology. *Current Opinion in Psychology*. 2017; 16: 43-47. doi: 10.1016/j.copsyc.2017.03.009
4. Chen X, Zhao Z, Laster KV, et al. Advancements in therapeutic peptides: Shaping the future of cancer treatment. *Biochimica et Biophysica Acta (BBA)—Reviews on Cancer*. 2024; 1879(6): 189197. doi: 10.1016/j.bbcan.2024.189197
5. Wang Y, Jiang Y, Luo D, et al. The awareness of depression and anxiety in cancer patients. *Journal of Clinical Oncology*. 2016. doi: 10.1200/JCO.2016.34.15\_suppl.e21550
6. Ghanmi L, Aloulou S, Mechri A, et al. Depression among elderly cancer patients. *European Psychiatry*. 2017; 41(S1): S528-S528. doi: 10.1016/j.eurpsy.2017.01.711
7. Noll KR, Bradshaw ME, Rexer J, et al. Neuropsychological Practice in the Oncology Setting. *Archives of Clinical Neuropsychology*. 2018; 33(3): 344-353. doi: 10.1093/arclin/axx131
8. Spittle M, Daley EG, Gastin PB. Reasons for choosing an exercise and sport science degree: Attractors to exercise and sport science. *Journal of Hospitality, Leisure, Sport & Tourism Education*. 2021; 29: 100330. doi: 10.1016/j.jhlste.2021.100330
9. von Blanckenburg P, Leppin N. Psychological interventions in palliative care. *Current Opinion in Psychiatry*. 2018; 31(5): 389-395. doi: 10.1097/ycp.0000000000000441
10. Chen J, Liu L, Wang Y, et al. Effects of psychotherapy interventions on anxiety and depression in patients with gastrointestinal cancer: A systematic review and network meta-analysis. *Journal of Psychosomatic Research*. 2024; 179: 111609. doi: 10.1016/j.jpsychores.2024.111609
11. Low CE, Pillay RM, Teo FJJ, et al. Educational interventions to reduce depression and anxiety in older adults with cancer in the community: a systematic review, meta-analysis and meta-regression of randomised controlled trials. *Age and Ageing*. 2024; 53(6). doi: 10.1093/ageing/afae111
12. Wang S, Li M, Wu Y, et al. Effects of exercise interventions on cancer-related fatigue in children with cancer: A meta-analysis. *Worldviews on Evidence-Based Nursing*. 2024; 21(6): 678-686. doi: 10.1111/wvn.12742
13. Hu Y, Gu S, Bu Z, et al. Effect of exercise for patients with advanced lung cancer and cancer-related fatigue: A systematic review and meta-analysis. *Journal of Sport and Health Science*. 2025; 14: 101017. doi: 10.1016/j.jshs.2024.101017
14. Bai L, Zhou Z. KS02.6.A Application of positive psychology intervention in continuous quality improvement of nursing care for patients with intracranial tumor. *Neuro-Oncology*; 2022. doi: 10.1093/neuonc/noac174.011
15. Semenenko E, Banerjee S, Olver I, et al. Review of psychological interventions in patients with cancer. *Supportive Care in Cancer*. 2023; 31(4). doi: 10.1007/s00520-023-07675-w
16. Cohen ZD, Barnes-Horowitz NM, Forbes CN, et al. Measuring the active elements of cognitive-behavioral therapies. *Behaviour Research and Therapy*. 2023; 167: 104364. doi: 10.1016/j.brat.2023.104364
17. Teo I, Krishnan A, Lee GL. Psychosocial interventions for advanced cancer patients: A systematic review. *Psycho-Oncology*. 2019; 28(7): 1394-1407. doi: 10.1002/pon.5103
18. Abu Khait A, Lazenby M. Psychosocial-spiritual interventions among Muslims undergoing treatment for cancer: an

- integrative review. *BMC Palliative Care*. 2021; 20(1). doi: 10.1186/s12904-021-00746-x
19. Zhang P, Mo L, Li X, et al. Psychological intervention and its immune effect in cancer patients. *Medicine*. 2019; 98(38): e17228. doi: 10.1097/md.00000000000017228
20. Graf J, Stengel A. Psychological Burden and Psycho-Oncological Interventions for Patients with Hepatobiliary Cancers—A Systematic Review. *Frontiers in Psychology*. 2021; 12. doi: 10.3389/fpsyg.2021.662777
21. Araceli T, Fischl A, Haj A, et al. Psycho-oncological burden in patients with brain metastases undergoing neurological surgery. *Frontiers in Oncology*. 2024; 14. doi: 10.3389/fonc.2024.1463467
22. Zhang N, Liu Y, Yu X, et al. Positive Coping Style and Family Resilience of Caregivers of COPD Patients: The Chain Mediating Roles of Caregiver Burden and Resilience. *Journal of Clinical Nursing*. 2024.
23. Cuijpers P, Pineda BS, Quero S, et al. Psychological interventions to prevent the onset of depressive disorders: A meta-analysis of randomized controlled trials. *Clinical Psychology Review*. 2021; 83: 101955. doi: 10.1016/j.cpr.2020.101955
24. Wang HQ, Lin H, Liu B. Research progress on the psychological burden and intervention measures in cancer patients. *Frontiers in Psychiatry*. 2024; 15. doi: 10.3389/fpsyg.2024.1408762
25. Aharon KB, Gershfeld-Litvin A, Amir O, et al. Improving cardiac rehabilitation patient adherence via personalized interventions. *PLOS ONE*. 2022; 17(8): e0273815. doi: 10.1371/journal.pone.0273815
26. Slomski A. Psychosocial Intervention Improves Adherence to Antidepressants. *JAMA*. 2017; 318(20): 1968. doi: 10.1001/jama.2017.17955
27. Biswal B, Gandhi Y, Singla DR, et al. Interventions for improving adherence to psychological treatments for common mental disorders: a systematic review. *Cambridge Prisms: Global Mental Health*. 2024; 11. doi: 10.1017/gmh.2024.94
28. Cincidda C, Oliveri S, Sanchini V, et al. The role of caregivers in the clinical pathway of patients newly diagnosed with breast and prostate cancer: A study protocol. *Frontiers in Psychology*. 2022; 13. doi: 10.3389/fpsyg.2022.962634
29. Murali KM, Lonergan M. Breaking the adherence barriers: Strategies to improve treatment adherence in dialysis patients. *Seminars in Dialysis*. 2020; 33(6): 475-485. doi: 10.1111/sdi.12925
30. Pham M, Lam BQ, Tuan Ngoc Bui A. Career exploration and its influence on the relationship between self-efficacy and career choice: The moderating role of social support. *Heliyon*. 2024; 10(11): e31808. doi: 10.1016/j.heliyon.2024.e31808
31. Chouhy C, Cullen FT, Lee H. A Social Support Theory of Desistance. *Journal of Developmental and Life-Course Criminology*. 2020; 6(2): 204-223. doi: 10.1007/s40865-020-00146-4
32. Sannes TS, Yeh IM, Gray TF. Caring for loved ones with cancer during the COVID-19 pandemic: A double hit risk for social isolation and need for action. *Psycho-Oncology*. 2020; 29(9): 1418-1420. doi: 10.1002/pon.5466
33. Ding Y, Wang X, Zhang F, et al. The relationship between perceived social support, coping style, and the quality of life and psychological state of lung cancer patients. *BMC Psychology*. 2024; 12(1). doi: 10.1186/s40359-024-01927-y
34. Howie JH, Faith LA, Jarvis SP, et al. Social Cognition and Other Determinants of Perceived Social Support in Individuals with Serious Mental Illness. *Journal of Nervous & Mental Disease*. 2023; 211(11): 848-855. doi: 10.1097/nmd.0000000000001708
35. Okonji EF, Mukumbang FC, Orth Z, et al. Psychosocial support interventions for improved adherence and retention in ART care for young people living with HIV (10–24 years): a scoping review. *BMC Public Health*. 2020; 20(1). doi: 10.1186/s12889-020-09717-y
36. Donachie K, Cornel E, Pelgrim T, et al. What interventions affect the psychosocial burden experienced by prostate cancer patients undergoing active surveillance? A scoping review. *Supportive Care in Cancer*. 2022; 30(6): 4699-4709. doi: 10.1007/s00520-022-06830-z
37. Persson PB, Persson AB. Mobility, motion, and exercise. *Acta Physiologica*. 2024; 240(11). doi: 10.1111/apha.14210
38. Vitale JA, Banfi G, La Torre A, et al. Effect of a Habitual Late-Evening Physical Task on Sleep Quality in Neither-Type Soccer Players. *Frontiers in Physiology*. 2018; 9. doi: 10.3389/fphys.2018.01582
39. Miller R, Northey J, Toohey K. Physical Exercise and Cancer: Exploring Chemotherapy Infusion as an Opportunity for Movement. *Seminars in Oncology Nursing*. 2020; 36(5): 151068. doi: 10.1016/j.soncn.2020.151068
40. Schaffrath N, Oberste M, Zimmer P. Effects of exercise interventions and physical activity behavior on cancer-related cognitive impairments: an update. *Current Opinion in Supportive & Palliative Care*. 2017; 11(1): 52-59. doi: 10.1097/spc.0000000000000249
41. Kleinert J. Psychological effects of sport and exercise in cancer patients: a review of recent reviews (German). *Der*

- Gastroenterologie. 2019; 14(5): 357-367. doi: 10.1007/s11377-019-0375-9
42. Yamada PM, Teranishi-Hashimoto C, Bantum EO. Paired exercise has superior effects on psychosocial health compared to individual exercise in female cancer patients. *Supportive Care in Cancer*. 2021; 29(11): 6305-6314. doi: 10.1007/s00520-021-06209-6
43. Sitjar PHS, Tan SY, Wong M, et al. Combined aerobic and strength exercise training on biological ageing in Singaporean breast cancer patients: protocol for the Breast Cancer Exercise Intervention (BREXINT) Pilot Study. *GeroScience*. 2024; 46(6): 6029-6038. doi: 10.1007/s11357-024-01145-9
44. Radak Z, Torma F, Berkes I, et al. Exercise effects on physiological function during aging. *Free Radical Biology and Medicine*. 2019; 132: 33-41. doi: 10.1016/j.freeradbiomed.2018.10.444
45. Fan C, Yan H, Lei K, et al. Effect of Tai Chi-Based Psychosomatic Rehabilitation Exercise on Physiological Function and Mental Health of Patients with Coronary Heart Disease: A Meta-Analysis. *Reviews in Cardiovascular Medicine*. 2024; 25(6). doi: 10.31083/j.rcm2506227
46. Teplinsky E, Podolski A, Burke B, et al. Abstract OT2-13-01: Supervised training exercise program during chemotherapy for breast cancer (STRENGTH) trial. *Cancer Research*; 2022. doi: 10.1158/1538-7445.sabcs21-ot2-13-01
47. Chen Y, Li X, Ma H, et al. Exercise Training for Improving Patient-Reported Outcomes in Patients with Advanced-Stage Cancer: A Systematic Review and Meta-Analysis. *Journal of Pain and Symptom Management*. 2020; 59(3): 734-749. doi: 10.1016/j.jpainsymman.2019.09.010
48. Jiang SH, Hu LP, Wang X, et al. Neurotransmitters: emerging targets in cancer. *Oncogene*. 2019; 39(3): 503-515. doi: 10.1038/s41388-019-1006-0
49. Liyanarachchi K, Ross R, Debono M. Human studies on hypothalamo-pituitary-adrenal (HPA) axis. *Best Practice & Research Clinical Endocrinology & Metabolism*. 2017; 31(5): 459-473. doi: 10.1016/j.beem.2017.10.011
50. Sánchez ML, Rodríguez FD, Coveñas R. Involvement of the Opioid Peptide Family in Cancer Progression. *Biomedicines*. 2023; 11(7): 1993. doi: 10.3390/biomedicines11071993
51. Henriksson M, Wall A, Nyberg J, et al. Effects of exercise on symptoms of anxiety in primary care patients: A randomized controlled trial. *Journal of Affective Disorders*. 2022; 297: 26-34. doi: 10.1016/j.jad.2021.10.006
52. Palesh O, Scheiber C, Kesler S, et al. Management of side effects during and post-treatment in breast cancer survivors. *The Breast Journal*. 2017; 24(2): 167-175. doi: 10.1111/tbj.12862
53. Lopez G, Chaoul A, Powers-James C, et al. A Pragmatic Evaluation of Symptom Distress After Group Meditation for Cancer Patients and Caregivers: A Preliminary Report. *Journal of Pain and Symptom Management*. 2018; 55(5): 1321-1326.e1. doi: 10.1016/j.jpainsymman.2018.01.018
54. Grégoire C, Faymonville ME, Jerusalem G, et al. Psycho-oncology interventions focusing on fatigue and sleep disturbances. *Current Opinion in Oncology*; 2022. doi: 10.1097/cco.0000000000000847
55. Li CQ, Wang YC, Shen SQ, et al. Effects of exercise by type and duration on quality of life in patients with digestive system cancers: A systematic review and network meta-analysis. *Journal of Sport and Health Science*. 2023; 12(4): 491-500. doi: 10.1016/j.jshs.2022.12.008
56. Ewuzie Z, Ezeano C, Aderinto N. A review of exercise interventions for reducing anxiety symptoms: Insights and implications. *Medicine*. 2024; 103(41): e40084. doi: 10.1097/md.00000000000040084
57. Faul LA, Jim HS, Minton S, et al. Relationship of Exercise to Quality of Life in Cancer Patients Beginning Chemotherapy. *Journal of Pain and Symptom Management*. 2011; 41(5): 859-869. doi: 10.1016/j.jpainsymman.2010.07.019
58. Ahmed AE, Almuzaini AS, Alsadhan MA, et al. Health-Related Predictors of Quality of Life in Cancer Patients in Saudi Arabia. *Journal of Cancer Education*. 2017; 33(5): 1011-1019. doi: 10.1007/s13187-017-1198-3
59. Ji S, Baek JY, Go J, et al. Effect of Exercise and Nutrition Intervention for Older Adults with Impaired Physical Function with Preserved Muscle Mass (Functional Sarcopenia): A Randomized Controlled Trial. *Clinical Interventions in Aging*. 2025; 20: 161-170. doi: 10.2147/cia.s494781
60. AL-Mhanna SB, Wan Ghazali WS, Mohamed M, et al. Effectiveness of physical activity on immunity markers and quality of life in cancer patient: a systematic review. *PeerJ*; 2022. doi: 10.7717/peerj.13664
61. Ülger Ö, Yağlı NV. Effects of yoga on the quality of life in cancer patients. *Complementary Therapies in Clinical Practice*. 2010; 16(2): 60-63. doi: 10.1016/j.ctcp.2009.10.007
62. Lee H, Park EY, Sung JH. Validation of the Korean Version of the Cancer Fatigue Scale in Patients with Cancer. *Healthcare*.

- 2023; 11(12): 1796. doi: 10.3390/healthcare11121796
63. Martin-Sanchez C, Fernández-Rodríguez EJ, Lopez-Mateos Y, et al. Effects of a Resistance Exercise Program in Patients with Colorectal Cancer Undergoing Chemotherapy Treatment: A Randomized Controlled Trial Study Protocol. *Journal of Clinical Medicine*. 2024; 13(15): 4478. doi: 10.3390/jcm13154478
64. Villumsen BR, Jorgensen MG, Frystyk J, et al. Home-based 'exergaming' was safe and significantly improved 6-min walking distance in patients with prostate cancer: a single-blinded randomised controlled trial. *BJU International*. 2019; 124(4): 600-608. doi: 10.1111/bju.14782
65. Shamallakh AN, Imam AM. Quality of life in patients with cancer in the Gaza Strip: a cross-sectional study. *The Lancet*; 2017. doi: 10.1016/S0140-6736(17)32072-X
66. Sweegers MG, Buffart LM, van Veldhuizen WM, et al. How Does a Supervised Exercise Program Improve Quality of Life in Patients with Cancer? A Concept Mapping Study Examining Patients' Perspectives. *The Oncologist*. 2018; 24(6): e374-e383. doi: 10.1634/theoncologist.2017-0613
67. Hou H, Fang K, Zhang YL, et al. Efficacy of a Combination of Functional Exercise and Psychological Interventions in Improving Postoperative Rehabilitation and Intervention Compliance in Patients with Breast Cancer. *Clinical Breast Cancer*. 2024; 24(8): 699-704. doi: 10.1016/j.clbc.2024.08.007
68. Ingwersen KG, Vobbe JW, Pedersen LL, et al. Effect of Psychomotricity in Combination with 3 Months of Active Shoulder Exercises in Individuals with Chronic Shoulder Pain: Primary Results from an Investigator-Blinded, Randomized, Controlled Trial. *Archives of Physical Medicine and Rehabilitation*. 2019; 100(11): 2136-2143. doi: 10.1016/j.apmr.2019.05.032
69. Ilie G, Rendon R, Mason R, et al. A Comprehensive 6-mo Prostate Cancer Patient Empowerment Program Decreases Psychological Distress Among Men Undergoing Curative Prostate Cancer Treatment: A Randomized Clinical Trial. *European Urology*. 2023; 83(6): 561-570. doi: 10.1016/j.eururo.2023.02.009
70. Wang Y, Zhang X, Wang X, et al. Combined Mindfulness-Based Stress Reduction and Exercise Intervention for Improving Psychological Well-Being in Patients with Non-Small Cell Lung Cancer. *Clinical Psychology & Psychotherapy*. 2024; 31(4). doi: 10.1002/cpp.3023
71. Braam KI, van Dijk-Lokkart EM, van Dongen JM, et al. Cost-effectiveness of a combined physical exercise and psychosocial training intervention for children with cancer: Results from the quality of life in motion study. *European Journal of Cancer Care*. 2016; 26(6): e12586. doi: 10.1111/ecc.12586
72. Thomas J, Thirlaway K, Bowes N, et al. Effects of combining physical activity with psychotherapy on mental health and well-being: A systematic review. *Journal of Affective Disorders*. 2020; 265: 475-485. doi: 10.1016/j.jad.2020.01.070
73. Lundqvist C, Schary DP, Jacobsson J, et al. Aligning categories of mental health conditions with intervention types in high-performance sports: A narrative cornerstone review and classification framework. *Journal of Science and Medicine in Sport*. 2024; 27(8): 525-531. doi: 10.1016/j.jsams.2024.05.001
74. Oorschot S, Brehm MA, van Groenestijn AC, et al. Efficacy of a physical activity programme combining individualized aerobic exercise and coaching to improve physical fitness in neuromuscular diseases (I'M FINE): study protocol of a randomized controlled trial. *BMC Neurology*. 2020; 20(1). doi: 10.1186/s12883-020-01725-0
75. Dragesund T, Kvåle A. Study protocol for Norwegian Psychomotor Physiotherapy versus Cognitive Patient Education in combination with active individualized physiotherapy in patients with long-lasting musculoskeletal pain – a randomized controlled trial. *BMC Musculoskeletal Disorders*. 2016; 17(1). doi: 10.1186/s12891-016-1159-8
76. Minnella EM, Baldini G, Quang ATL, et al. Prehabilitation in Thoracic Cancer Surgery: From Research to Standard of Care. *Journal of Cardiothoracic and Vascular Anesthesia*. 2021; 35(11): 3255-3264. doi: 10.1053/j.jvca.2021.02.049
77. Fleckenstein J, Floessel P, Engel T, et al. Individualized Exercise in Chronic Non-Specific Low Back Pain: A Systematic Review with Meta-Analysis on the Effects of Exercise Alone or in Combination with Psychological Interventions on Pain and Disability. *The Journal of Pain*. 2022; 23(11): 1856-1873. doi: 10.1016/j.jpain.2022.07.005
78. Barnes K, Hladkiewicz E, Dorrance K, et al. Barriers and facilitators to participation in exercise prehabilitation before cancer surgery for older adults with frailty: a qualitative study. *BMC Geriatrics*. 2023; 23(1). doi: 10.1186/s12877-023-03990-3
79. Tao X, Chow SKY, Wong FK. The effects of a nurse-supervised home exercise programme on improving patients' perceptions of the benefits and barriers to exercise: A randomised controlled trial. *Journal of Clinical Nursing*. 2017; 26(17-18): 2765-2775. doi: 10.1111/jocn.13798
80. O'Connor D, Fernandez MM, Signorelli G, et al. Personalised and progressive neuromuscular electrical stimulation (NMES)

- in patients with cancer—a clinical case series. *Supportive Care in Cancer*. 2019; 27(10): 3823-3831. doi: 10.1007/s00520-019-04679-3
81. Turrentine FE, Schroen AT, Hallowell PT, et al. Enhancing Medical Students' Interprofessional Teamwork Through Simulated Room of Errors Experience. *Journal of Surgical Research*. 2020; 251: 137-145. doi: 10.1016/j.jss.2020.02.001
82. Mirandola D, Miccinesi G, Muraca MG, et al. Longitudinal assessment of the impact of adapted physical activity on upper limb disability and quality of life in breast cancer survivors from an Italian cohort. *Supportive Care in Cancer*. 2017; 26(2): 329-332. doi: 10.1007/s00520-017-3930-2
83. Gosa MM, Dodrill P, Lefton-Greif MA, Silverman A. A Multidisciplinary Approach to Pediatric Feeding Disorders: Roles of the Speech-Language Pathologist and Behavioral Psychologist. *American Journal of Speech-Language Pathology*. 2020; 29(2S): 956-66. doi: 10.1044/2020\_AJSLP-19-00069
84. McLaughlin-Barrett S. Outnumbered yet needed: The Lung Cancer Nurse Specialist. *Respirology*. 2020; 25(10): 1027-1028. doi: 10.1111/resp.13844
85. Ramírez-Vélez R, Zambom-Ferraresi F, García-Hermoso A, et al. Evidence-Based Exercise Recommendations to Improve Mental Wellbeing in Women with Breast Cancer during Active Treatment: A Systematic Review and Meta-Analysis. *Cancers*. 2021; 13(2): 264. doi: 10.3390/cancers13020264
86. Pereyra-Talamantes A, Flores-Martín JE, Almazán-Urbina FE, et al. Benefits of multidisciplinary team management of obese patients with intragastric balloon placement: an analysis of 159 cases at a single center. *Surgery for Obesity and Related Diseases*. 2020; 16(12): 2068-2073. doi: 10.1016/j.soard.2020.07.006
87. Dâmaso AR, Masquio DCL, Campos RMdS, et al. Effects of multidisciplinary therapy on energy balance, inflammation, and metabolic diseases in adolescents with obesity: A narrative review. *Annals of the New York Academy of Sciences*; 2024.
88. Oblinger-Peters V, Henriksen K, Ronkainen NJ. Searching for meaning and purpose in elite sport: A narrative review of sport psychology literature with theoretical insights from psychology. *Psychology of Sport and Exercise*. 2025; 76: 102725. doi: 10.1016/j.psychsport.2024.102725
89. Pitt T, Lindsay P, Thomas O, et al. A perspective on consultancy teams and technology in applied sport psychology. *Psychology of Sport and Exercise*. 2015; 16: 36-44. doi: 10.1016/j.psychsport.2014.07.002
90. Baker J, Johnston K. An Evolutionary Psychology Perspective on Athletic Development and Performance: Differences Between Proximate and Ultimate Explanations. *Sports Medicine*. 2024; 55(1): 1-7. doi: 10.1007/s40279-024-02155-5
91. Liu Y, Li S, Guo J, et al. The Application of Virtual Reality Technology in Sports Psychology: Theory, Practice, and Prospect. *Computational Intelligence and Neuroscience*. 2022; 2022: 1-11. doi: 10.1155/2022/5941395
92. Babu M, Lautman Z, Lin X, et al. Wearable Devices: Implications for Precision Medicine and the Future of Health Care. *Annual Review of Medicine*. 2024; 75(1): 401-415. doi: 10.1146/annurev-med-052422-020437
93. Mohtasebi M, Huang C, Zhao M, et al. A Wearable Fluorescence Imaging Device for Intraoperative Identification of Human Brain Tumors. *IEEE Journal of Translational Engineering in Health and Medicine*. 2024; 12: 225-232. doi: 10.1109/jtehm.2023.3338564
94. Song X, Fan Y, Tang X. FBG-based wearable sensors and devices in the healthcare field: A review. *Optics & Laser Technology*. 2025; 181: 111920. doi: 10.1016/j.optlastec.2024.111920
95. Weyhe D, Obonyo D, Uslar V, et al. Effects of intensive physiotherapy on Quality of Life (QoL) after pancreatic cancer resection: a randomized controlled trial. *BMC Cancer*. 2022; 22(1). doi: 10.1186/s12885-022-09586-1
96. Dangi RR, Sharma A, Vageriya V. Transforming Healthcare in Low-Resource Settings with Artificial Intelligence: Recent Developments and Outcomes. *Public Health Nursing*; 2024.
97. Bergerot CD, Bergerot PG, Philip EJ, et al. Enhancing Cancer Supportive Care: Integrating Psychosocial Support, Nutrition, and Physical Activity Using Telehealth Solutions. *JCO Global Oncology*. 2024; (10). doi: 10.1200/go-24-00333
98. Hecker JS, Algül H, Illert AL, et al. The Technical University of Munich Cancer Center - elevating cancer treatment through science. *Molecular Cancer*. 2024; 23(1). doi: 10.1186/s12943-024-02127-3
99. Jayawickrama SM, Ranaweera PM, Pradeep RGGR, et al. Developments and future prospects of personalized medicine in head and neck squamous cell carcinoma diagnoses and treatments. *Cancer Reports*. 2024; 7(3). doi: 10.1002/cnr2.2045
100. Petkovic K, Strika Z, Likic R, et al. Spotlight commentary: Integrating artificial intelligence in clinical pharmacology: Opportunities, challenges and ethical imperatives. *British Journal of Clinical Pharmacology*. 2024; 90(11): 2700-2704. doi: 10.1111/bcp.16241