

Review

Assessment of the ecological health and psychological benefits of Arts-Based Therapy and exercise therapy for potential cancer patients

Qi Lun¹, Mei Gong², Qiang Qin^{3,*}

¹ School of Physical Education, Shandong University, Ji'nan 250061, Shandong, China

² Physical Education, Sejong University School, Seoul 05006, Republic of Korea

³ College of Fine Arts, Hongik University, Seoul 04066, Republic of Korea

* Corresponding author: Qiang Qin, qinqiang0611@126.com

CITATION

Lun Q, Gong M, Qin Q. Assessment of the ecological health and psychological benefits of arts-based therapy and exercise therapy for potential cancer patients. *Psycho-Oncologie*. 2025; 19(4): 5611. <https://doi.org/10.18282/po5611>

ARTICLE INFO

Received: 28 August 2025

Revised: 21 October 2025

Accepted: 10 November 2025

Available online: 9 December 2025

COPYRIGHT



Copyright © 2025 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: This review explores how Arts-Based Therapy therapy and exercise therapy contribute to ecological health and psychological resilience among individuals at potential risk of cancer. It synthesises evidence from environmental psychology, physical education, and psycho-oncology to illustrate how natural engagement and physical movement operate as complementary interventions within an ecological model of health. The discussion identifies the shared principles of rhythm, awareness, and participation that unite both approaches. Arts-Based Therapy therapy engages sensory, cognitive, and emotional systems through direct interaction with living environments, restoring calmness and meaning through care and observation. Exercise therapy promotes physiological regulation, emotional stability, and cognitive clarity through structured movement and mindful breathing. When integrated, these interventions reinforce one another by combining ecological awareness with bodily adaptation, producing a balanced state of well-being that extends from the individual to the community. The analysis highlights their value in prevention and recovery by reducing stress, improving self-regulation, and strengthening motivation for sustainable health behaviour. Recommendations include clinical integration of therapeutic gardens and movement programs, interdisciplinary education for practitioners, and public policies that recognise ecological and physical activity as essential components of preventive care. Future directions call for research linking biological mechanisms with subjective experience and for the design of inclusive therapeutic environments that connect health promotion with environmental stewardship. The findings affirm that the cooperation between nature, body, and mind provides a foundation for resilience and a sustainable model of psycho oncological care.

Keywords: ecological health; exercise therapy; Arts-Based Therapy therapy; psychological resilience; psycho-oncology; sustainable care

1. Introduction

Cancer continues to present a major challenge to global public health. Its increasing prevalence is closely related to changes in lifestyle, work environments, and emotional conditions in modern society [1]. Advances in medicine have improved detection and treatment [2], yet the psychosocial burden of the disease remains profound [3]. Many of the same environmental and behavioral factors that contribute to disease progression also weaken psychological resilience [4]. Therefore, cancer prevention and recovery are now understood through broader perspectives that incorporate ecological awareness, emotional balance, and healthy behaviors [5].

1.1. Global cancer epidemiology and psychosocial risk factors

The steady growth of cancer incidence reflects the combined influence of biological, environmental, and socioeconomic factors [6]. Long working hours, limited contact with natural surroundings, and sustained emotional distress create physiological imbalances that may elevate cancer risk [7]. Anxiety, depression, and feelings of social isolation are frequently observed among individuals experiencing chronic stress or fear of illness [8]. These psychological states can alter sleep, diet, and immune response, indirectly increasing susceptibility to various diseases, including cancer.

The human response to cancer extends beyond physical symptoms. Diagnosis or even the perception of cancer risk often brings fear, uncertainty, and emotional fatigue [9]. These psychological reactions can significantly influence coping behaviors and overall health outcomes [10]. Understanding such psychosocial dynamics is essential for designing preventive interventions that strengthen both mental and physical health before illness occurs [11].

1.2. Preventive and lifestyle oriented healthcare paradigms

Modern health systems increasingly emphasize prevention through behavior change and education [12]. The aim is to cultivate habits that sustain balance and resilience rather than to react solely after disease appears [13]. Physical activity, stress management, and contact with supportive environments are viewed as central tools for prevention [14]. Within this framework, non-pharmacological and community-based programs have gained attention because they are accessible, low cost, and adaptable to different settings [15].

Arts-Based Therapy and exercise therapy embody these principles [14]. They encourage active participation, connect individuals to their surroundings, and restore a sense of self-regulation [16]. By focusing on the natural relationship between movement, perception, and emotion, these interventions promote overall well-being and offer a foundation for sustainable preventive health [16,17].

1.3. The ecological model of health: Human nature body interaction

The ecological model of health describes the human organism as an integral component of the natural world [18]. Physical and psychological states are influenced by environmental quality, sensory input, and patterns of social interaction [19]. Engagement with natural settings tends to stabilize physiological rhythms such as heart rate and breathing [20]. Exposure to greenery, natural light, and open air supports attention, relaxation, and recovery from stress [21].

This model posits that health cannot be maintained in isolation from the environment [22]. Environmental negligence can lead to human imbalance, just as personal disconnection contributes to ecological decline [23]. Engaging with plants, soil, and landscapes fosters mindfulness and empathy, which in turn can improve personal health [24]. From an ecological health perspective, prevention involves engagement with environments that support physiological and emotional regulation, rather than relying solely on medical procedures [25].

1.4. Physical education's emerging role in psycho oncological prevention

Physical education traditionally emphasizes performance and discipline, but its pedagogical value extends far beyond physical skill. It offers a structured environment where emotional regulation, cooperation, and body awareness can be developed [26]. Educators in this field can contribute to mental wellbeing by helping individuals understand movement as both physical training and a method for organising attention and emotion [27].

In preventive contexts, physical education promotes motivation, confidence, and social engagement [28]. Exercise programs that incorporate breathing techniques, stretching, and outdoor activities align with psychological needs by encouraging concentration and relieving tension [29]. These activities also enhance the awareness of physical capabilities and strength. By connecting movement with meaningful experiences, physical education serves as a critical component in holistic strategies for promoting mental health and wellness [26].

1.5. Arts-Based Therapy and exercise therapy as dual ecological interventions

Arts-Based Therapy therapy and exercise therapy share the goal of restoring equilibrium through natural processes [30]. Arts-Based Therapy therapy emphasizes the nurturing relationship between humans and plants, stimulating the senses, promoting calmness, and encouraging responsibility through direct care for living organisms [31]. Exercise therapy focuses on movement, coordination, and physiological regulation [32]. When combined, these two approaches reinforce one another by engaging both environmental and bodily dimensions of health [33].

Gardening requires continuous yet moderate activity, such as planting, watering, and cultivating [34]. These actions promote flexibility, endurance, and fine motor coordination while simultaneously providing sensory and emotional satisfaction [35]. The outdoor environment enhances exposure to natural light, texture, and sound, producing a tranquil setting that supports emotional restoration [36]. Exercise therapy adds structure and intensity, improving circulation, muscle tone, and energy metabolism [32]. The integration of these practices provides a comprehensive ecological intervention that strengthens physical systems and nurtures emotional resilience [33].

1.6. Broader context of ecological and psychological integration

The separation between physical fitness and mental health in modern life has limited the effectiveness of preventive strategies. Many exercise routines are performed indoors, detached from nature, while environmental programs rarely address personal well-being [37]. Arts-Based Therapy and exercise therapy bridge this divide [38]. They restore continuity between body, mind, and environment through experiences that are active and relational [39].

Participation in community gardens or outdoor group exercise fosters social interaction and mutual support. Shared goals and collective care create belonging and reduce loneliness. The cooperation required in maintaining a garden or participating in group physical activity enhances communication, empathy, and shared

responsibility. These psychosocial dimensions are particularly important for individuals who may feel isolated or anxious about health risks [40].

Moreover, the ecological orientation of these interventions resonates with contemporary values of sustainability and community wellness [41]. By engaging directly with natural processes, participants develop awareness of environmental stewardship [42]. This consciousness transforms personal well-being into a contribution to broader ecological stability. In turn, healthy ecosystems provide the sensory and psychological nourishment that sustain human resilience [43].

1.7. Rationale for this review

Although Arts-Based Therapy and exercise therapies have each demonstrated benefits for health and quality of life, their combined application has received limited attention in psycho oncological research. Most existing studies treat them as separate categories, focusing either on physiological outcomes such as strength and endurance [44] or on psychological outcomes such as stress and mood [45]. A unified approach is needed to explain how ecological engagement and physical movement interact to support preventive mental and physiological balance [46].

This review therefore aims to synthesize available knowledge from physical education, environmental psychology, and oncology to illustrate how these two therapies function together within an ecological health framework. It seeks to identify the mechanisms that link environmental exposure, physical activity, and psychological adaptation, and to propose directions for interdisciplinary cooperation. The analysis emphasizes preventive application among individuals at potential risk of cancer and highlights practical implications for educational and community settings. In addition, this review contributes to psycho-oncology by integrating ecological and psychological perspectives to explain how nature-based engagement and structured movement support emotional and physiological regulation. It introduces a dual pathway model linking Arts-Based Therapy and exercise therapy, emphasises preventive application for individuals at potential risk of cancer, and presents conceptual frameworks that organise current evidence into a coherent foundation for future research and practice.

2. Methodology

This work follows a narrative review approach designed to integrate evidence from ecological health, Arts-Based Therapy therapy, exercise therapy, psychological wellbeing, and preventive cancer care. This method allows the synthesis of conceptual, experiential, and empirical literature without the restrictions of a systematic protocol. The aim was to identify themes that connect ecological participation and physical activity with psychological resilience in individuals at potential risk of cancer.

A structured search was conducted across Scopus, PubMed, Web of Science, and Google Scholar. Search terms included ecological health, Arts-Based Therapy therapy, therapeutic gardening, exercise therapy, physical activity, psychological resilience, nature-based intervention, and psycho-oncology. Studies were considered when they discussed human participants, addressed ecological or movement based therapeutic

practices, or examined psychological responses relevant to cancer prevention or recovery.

Articles were excluded when they focused solely on agricultural science, plant cultivation, or animal studies, or when their content did not address ecological, psychological, or clinical dimensions of health. The purpose was to include literature that contributed to the conceptual framework of ecological and psychophysiological wellbeing.

The selected publications were interpreted through thematic synthesis. Rather than extracting quantitative outcomes, the analysis focused on patterns of meaning across environmental engagement, emotional regulation, physical adaptation, and social participation. This approach allowed the development of an integrative model consistent with preventive psycho oncological perspectives. **Figure 1** presents a simplified overview of the narrative search and selection strategy.

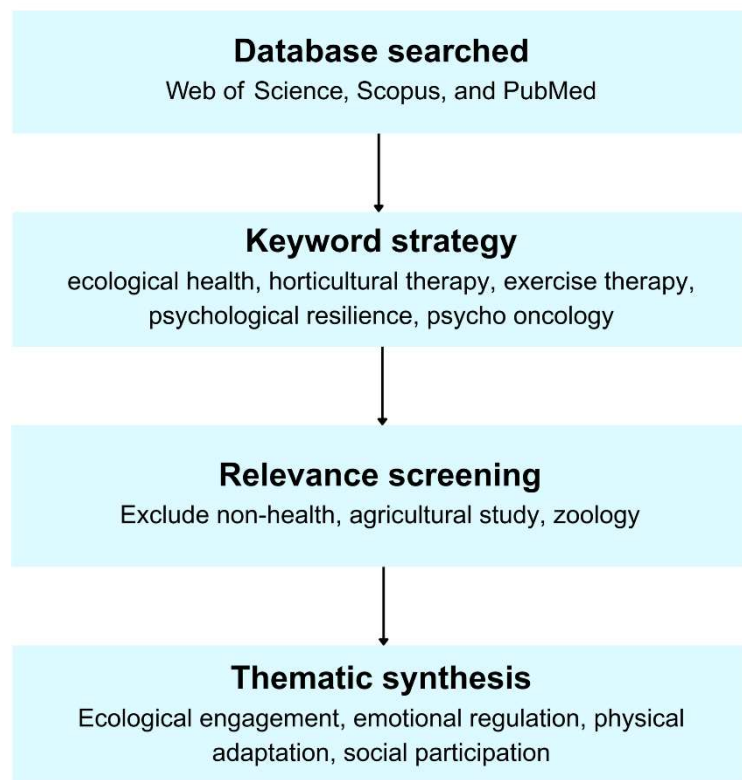


Figure 1. Narrative search and selection strategy. A conceptual diagram outlining the process through which relevant ecological, psychological, and exercise related literature was identified and synthesised for this review. The figure clarifies the narrative search approach and illustrates how thematic integration was achieved across multiple evidence domains.

3. Conceptual foundations

The conceptual base of this review rests on two complementary perspectives. The first is the ecological health perspective, which describes how natural environments support physiological and psychological stability [47]. The second is the psychological mechanism perspective, which explains how internal mental processes convert ecological and behavioral experiences into resilience and preventive psychological

and physical stability. Together, these perspectives form the theoretical framework that guides the integration of Arts-Based Therapy and exercise therapy for individuals at potential risk of cancer.

3.1. Ecological health perspective

Ecological health describes the dynamic relationship between people and their natural surroundings. Human life constantly interacts with the physical environment through air, light, temperature, and sound. When these exchanges are balanced, they support coordinated physical and psychological functioning. When disrupted, stress, fatigue, and disconnection emerge [48].

This relationship can be better understood through **Figure 1**, the Ecological Health Interaction Model, which presents three overlapping circles representing environmental exposure, physiological regulation, and psychological stability [49]. Environmental exposure refers to contact with natural elements such as light, air, soil, and vegetation [50]. Physiological regulation involves internal functions such as circulation, respiration, immune balance, and hormonal rhythm [51]. Psychological stability includes attention, emotion, and self-awareness. The intersection of these three domains represents ecological health, where physical and psychological processes function efficiently in response to environmental conditions [49].

As illustrated in **Figure 2**, the ecological state of health is not static but continuously maintained through sensory and behavioral interaction with nature. Activities such as gardening, outdoor walking, and mindful breathing in natural spaces help stabilize this balance. The sound of wind, the feeling of soil, or the scent of plants can regulate attention and ease emotional tension. Through this process, the individual does not only observe natural surroundings but engages actively with them. This engagement can strengthen reflective awareness and promote consistent self-care. The experience of care for living elements, in turn, cultivates care for oneself.

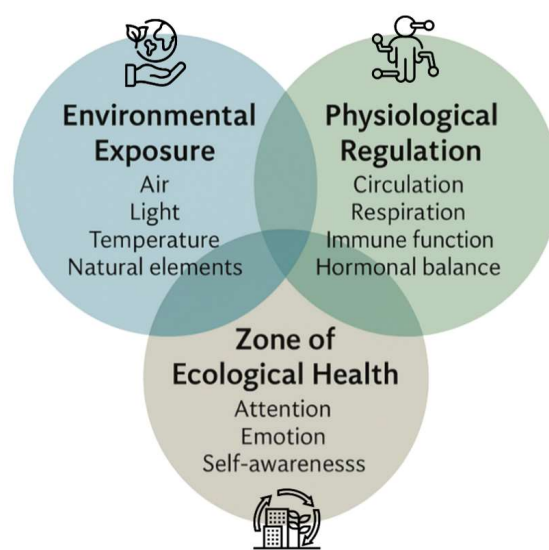


Figure 2. Ecological health interaction model. Diagram illustrating the relationship among environmental exposure, physiological regulation, and psychological processes. The overlapping zone highlights how attention, emotion, and self-

awareness emerge when environmental inputs and bodily regulatory systems interact. This model clarifies the ecological conditions that contribute to psychological stability and overall well-being.

For individuals who are vulnerable to chronic stress or illness, this participatory connection with nature can rebuild trust in bodily processes and promote calm awareness [52]. Ecological health therefore reflects both environmental conditions and the psychological factors that contribute to emotional stability [53].

3.2. Psychological mechanisms in cancer prevention

While ecological health describes the outer conditions of balance, psychological mechanisms explain the inner processes that transform these experiences into well-being. The mind interprets stimuli, organizes emotion, and guides behavior. Effective psychological functioning ensures that environmental exposure and physical activity result in lasting health benefits.

3.2.1. Stress and emotional regulation

Stress is an adaptive reaction to change; however, when it becomes prolonged, it can disrupt immune and hormonal systems. Psychological techniques that promote calm attention can mitigate these effects [54]. Gardening and rhythmic physical activities contribute to emotional regulation by creating conducive environments for mental focus and relaxation [55]. The repetitive motions involved in gardening, along with exposure to nature, can encourage slow breathing and promote a sense of mental clarity [56]. Within these contexts, individuals can regain a sense of safety and predictability.

The interplay between environment and movement plays a significant role in moderating emotional reactivity [57]. Natural stimuli, such as soil texture, airflow, and ambient sounds, help ground individuals in the present moment. This interaction can support focused attention and reduce emotional reactivity, contributing to lower anxiety [58].

3.2.2. Resilience and mindfulness

Resilience is the capacity to adapt positively when facing difficulty. It depends on both psychological flexibility and a supportive environment. Arts-Based Therapy and exercise therapy nurture resilience through repeated cycles of effort and visible progress [59]. Engaging with nature or participating in structured movement routines provides a tangible sense of continuity and achievement [60].

Mindfulness complements resilience. In a garden, attention rests on the living environment; in exercise, on the rhythm of the body [61]. These practices cultivate awareness without judgment, reducing fear and self-doubt. For individuals concerned about illness, mindful ecological activity promotes acceptance and confidence rather than avoidance and distress [62].

3.2.3. Self efficacy and behavioral activation

Self-efficacy is the conviction that one's actions can produce meaningful change. It determines persistence and motivation [63]. In the context of Arts-Based Therapy and exercise therapy, self-efficacy grows through visible results [64]. The simple act of seeing a plant flourish or feeling bodily strength increase confirms personal agency

[65]. Each successful task reinforces motivation, and this motivation sustains behavior. This creates a positive feedback loop: achievement enhances confidence, confidence fuels participation, and participation yields further achievement [66].

Behavioral activation arises when this loop becomes self-sustaining. At this stage, healthy activity is no longer externally imposed but internally driven [67,68]. For preventive oncology, this mechanism has significant implications. It suggests that encouraging engagement with manageable, rewarding tasks can create long-term adherence to healthy routines [69]. Arts-Based Therapy and exercise activities provide exactly this kind of reinforcing structure [70].

3.2.4. Psychological pathways in ecological interventions

The interaction of psychological mechanisms can be visualized through **Figure 3**, which depicts the dynamic pathway linking environmental exposure, perception, and behavioral change [71]. The diagram follows a continuous downward flow from initial contact with nature to behavioral activation, illustrating how each stage contributes to psychological and physiological balance [72].

As shown in **Figure 3**, the process begins with environmental contact, where the individual interacts with natural surroundings through light, air, sound, or texture. This contact stimulates the senses and initiates calm attention. The next stage, sensory regulation, represents the adjustment of bodily rhythms and awareness in response to environmental cues [73]. From there, cognitive appraisal occurs as the mind interprets the experience, attaching meaning and purpose to it [74].

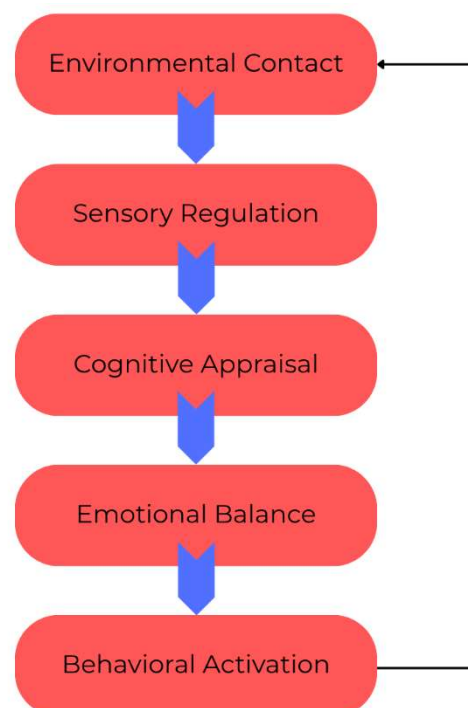


Figure 3. Psychological pathways in ecological interventions. A conceptual model illustrating the progression from environmental exposure to sensory regulation, cognitive appraisal, emotional adjustment, and behavioural activation. This pathway supports how ecological contact contributes to psychological change and can help

clinicians and educators interpret the mechanisms underlying nature-based interventions.

When perception becomes organized and purposeful, the result is emotional balance, a condition marked by reduced anxiety and improved self-acceptance. This emotional regulation enhances motivation, leading to behavioral activation, in which engagement with health-promoting activities becomes consistent and self-reinforcing. The feedback arrow connecting the final stage back to environmental contact symbolizes continuity: once behavioral activation is achieved, individuals naturally seek further contact with restorative environments, maintaining a positive cycle of regulation and resilience [75].

This model emphasizes that psychological change within ecological interventions follows a recurrent process rather than a strictly linear pattern [76]. Each engagement with nature refines attention, stabilizes emotion, and deepens motivation, resulting in ongoing adaptation that supports both mental and physical well-being [77].

3.2.5. Integration of ecological and psychological models

When the ecological and psychological models are viewed together, they reveal an integrated system in which environmental exposure, physical activity, and emotional interpretation interact to produce coordinated effects [78]. The ecological model provides the outer framework of balance, while the psychological model offers insights into emotional regulation and resilience [79].

Arts-Based Therapy and exercise therapy occupy the intersection of these two models. Environmental engagement provides sensory stimulation and context for reflection; physical movement organizes bodily rhythm; and reflective attention helps integrate sensory, and emotional responses [80]. The resulting synergy produces stability that extends beyond temporary relief into enduring well-being [81].

For educators and health professionals, understanding this integration supports the design of interventions that are evidence-based yet personally meaningful [79]. By combining ecological exposure with psychological practice, they can create preventive programs that foster resilience, confidence, and inner peace [82]. Whether in rehabilitation gardens, university campuses, or community parks, the underlying principle remains consistent: health is supported through active engagement, physical activity, and attentional practices [83].

4. Arts-Based Therapy therapy and cancer related well being

Arts-Based Therapy therapy provides a practical example of how engagement with natural environments can support psychological adaptation and physical recovery. Unlike conventional exercise or clinical counseling, Arts-Based Therapy activity engages the complete person in body, emotion, and intellect through direct interaction with nature. Within preventive psycho-oncology this form of therapy encourages structured engagement with plants that can support resilience and emotional stability. The garden functions as both a physical environment and a therapeutic setting in which sensory engagement and emotional recovery can take place.

4.1. Evidence base

Participation in Arts-Based Therapy therapy can promote emotional well-being and cognitive renewal. Engaging in the rhythmic tasks of planting, watering, and nurturing plants help individuals redirect their focus from distress toward meaningful activities, thereby promoting a sense of calm and concentration. This engagement has been found beneficial for enhancing emotional regulation and may improve cognitive functions such as memory and problem-solving, particularly in individuals experiencing stress-related fatigue or anxiety [84]. Evidence from cancer care indicates that Arts-Based Therapy therapy can reduce stress and improve emotional functioning, as demonstrated in a study where patients engaging in structured gardening activities reported significant mood improvement [85].

Physiologically, Arts-Based Therapy activities provide gentle exercise that enhances circulation, flexibility, and balance. Furthermore, the exposure to natural elements, such as sunlight and fresh air, can positively influence metabolic processes and support the nervous system, aiding in the recovery from mental fatigue [86]. Socially, gardening fosters cooperative interactions and meaningful connections among participants. Collaborative gardening tasks can improve social bonds and empathy, while group gardening experiences help mitigate feelings of isolation. For individuals facing health challenges or recovering from medical treatments, the communal aspect of gardening can restore a sense of capability and encourage renewed social engagement [87].

The diverse effects of Arts-Based Therapy therapy can be summarized in **Table 1**, which outlines its observed outcomes and interpretive significance within an ecological and psycho oncological perspective.

Table 1. Summary of outcomes associated with Arts-Based Therapy therapy. A structured overview of emotional, cognitive, physical, social, and experiential outcomes commonly reported in Arts-Based Therapy therapy.

Domain	Observed benefit	Interpretation in ecological context
Emotional	Calmness and reduced anxiety	The rhythm of nature stabilizes emotion
Cognitive	Improved focus and planning	Sensory variety supports flexible attention
Physical	Better coordination and endurance	Gentle movement harmonizes body rhythm
Social	Empathy and cooperation	Shared cultivation builds belonging
Existential	Purpose and gratitude	Growth cycles embody renewal and meaning

4.2. Mechanisms of action

The effectiveness of Arts-Based Therapy therapy is grounded in its ability to integrate physical activity, sensory stimulation, and emotional participation. Across health care and educational settings, gardening has demonstrated the capacity to reduce distress, strengthen social connections, and increase self-awareness [88]. The structured sequence of planting, tending, and observing can support attentional focus and promote a calm psychological state. Participants often report reduced stress and a sense of achievement after engaging in gardening activities [76]. Simple activities such as watering or arranging plants invite slow breathing, enhance present awareness, and promote emotional release. The repetitive yet meaningful nature of these actions

can reduce rumination and help individuals focus on immediate experiences [89]. The garden offers visible feedback: when effort produces growth, confidence often follows.

Physiologically, Arts-Based Therapy activity promotes gentle exercise that improves circulation, flexibility, and balance. Exposure to sunlight and fresh air can enhance metabolic and hormonal regulation, while contact with natural elements may stabilize the nervous system [90]. These responses contribute to releasing tension and supporting recovery from fatigue [91]. Socially, gardening provides a structure for collaboration.

Social and symbolic layers add further depth. When people garden together, conversation arises naturally, free from formality or confrontation. Cooperation is guided by shared purpose rather than instruction. Symbolically, the life cycle of plants mirrors human adaptation: growth and rest, loss and recovery. The garden becomes a living metaphor through which participants integrate vulnerability with resilience. The interaction of these mechanisms can be visualized in **Figure 4**, which presents the conceptual structure of Arts-Based Therapy therapy as a framework of concentric layers.

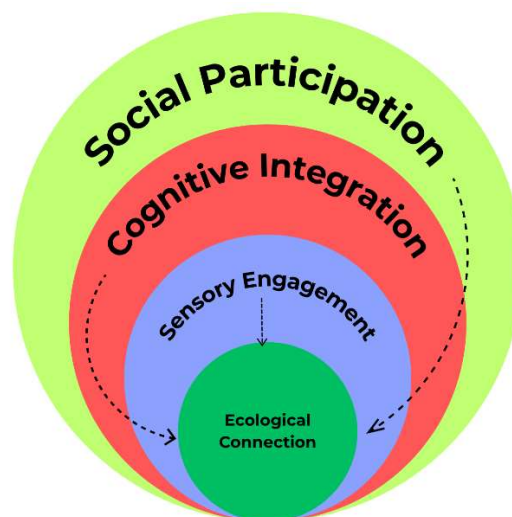


Figure 4. Arts-Based Therapy therapy mechanism framework. The framework visualizes how Arts-Based Therapy therapy transforms perception into participation. Each layer strengthens the others, forming an illustrating how engagement with natural environments can support regulation, attention, and social connection.

4.3. Applications and practice

The adaptability of Arts-Based Therapy therapy allows its use across clinical, educational, and community environments. In hospitals, gardens provide patients with an active yet peaceful space for rehabilitation. Simple tasks such as planting herbs or arranging flowers help restore a sense of agency. For those in recovery, Arts-Based Therapy sessions mark the transition from medical treatment to independent living [32].

In educational institutions, campus gardens combine environmental learning with stress management. Students who engage in gardening experience better concentration, lower anxiety, and stronger social connection. Campus gardens provide structured settings where environmental learning and psychological support can occur

simultaneously. These settings also encourage research into the relationship between ecological participation and emotional health [92].

Community gardens extend the therapeutic principle to society. They build networks of care and environmental stewardship. Shared cultivation fosters civic pride, intergenerational exchange, and sustainable behavior. Through collective gardening, prevention becomes not an individual responsibility but a social practice. The benefits of cooperation in the soil are mirrored in the emotional soil of community [31].

Design principles for therapeutic gardens emphasize accessibility, sensory richness, and symbolic coherence. Paths should be circular or gently curving to suggest continuity. Raised beds enable participation by people with limited mobility. A variety of plants should be selected for color, scent, and texture to stimulate different senses. Water features, shade, and seating areas support rest and reflection. Design features should balance accessibility with areas for rest and privacy to accommodate diverse user needs [93].

Professional training ensures that Arts-Based Therapy therapy is delivered with sensitivity and scientific understanding. Facilitators must possess knowledge of plant care, counseling, and group dynamics. Collaboration between professionals in various fields, such as education, psychology, and landscape design, can enhance the quality of programs. Ethical guidelines and structured evaluation are important for maintaining consistency and credibility in practice [94].

These applications indicate that Arts-Based Therapy therapy can function as a structured intervention that supports psychological and physical well-being. By uniting sensory experience, bodily movement, mindfulness, and community interaction, it supports the ecological and psychological dimensions of health simultaneously.

4.4. Extended impact and future integration

Arts-Based Therapy therapy demonstrates that human well-being is deeply intertwined with ecological balance. Caring for plants reinforces empathy and patience, observing plant development can encourage confidence in gradual and measurable progress. Through continuous participation, individuals develop ecological awareness that extends beyond the garden. This awareness contributes to sustainable attitudes and strengthens the connection between personal health and planetary health [95].

Research and evaluation can further validate this field by combining physiological and psychological measures. Future studies should track changes in stress indicators, immune response, and emotional self-reports over time. Mixed-method designs that unite quantitative data with narrative reflection will provide a complete picture of how ecological participation supports mental resilience [96].

Institutional support is essential for broad implementation. Hospitals, universities, and municipalities can collaborate to create therapeutic gardens accessible to the public. Policies recognizing green environments as health infrastructure will integrate ecological therapy into preventive frameworks. Funding such spaces is an investment not only in human recovery but also in environmental preservation. Community engagement extends Arts-Based Therapy therapy from individual benefit to broader social participation. Gardens become places of learning, conversation, and shared

growth. They embody the principle that to cultivate life outside oneself is to strengthen life within [97,98].

4.5. Integrative reflection

Arts-Based Therapy therapy incorporates both evidence-based methods and experiential engagement. It suggests that recovery is supported by active engagement with meaningful environments. Simple gardening activities can reinforce consistent routines and support a sense of progress. Exposure to natural elements such as soil, light, and outdoor conditions can contribute to improved psychological regulation [99].

For individuals facing the uncertainty of illness or the anxiety of potential diagnoses, Arts-Based Therapy therapy offers an accessible way to reconnect with meaning and control. For society, it provides a model of health promotion that respects nature while strengthening human solidarity. Within the philosophy of psycho-oncology, Arts-Based Therapy therapy represents the living expression of ecological balance as an art of healing that is as ancient as cultivation itself and as modern as the need for sustainable well-being [100].

5. Exercise therapy and psychophysiological resilience

Exercise therapy has become a vital part of preventive psycho-oncology because it integrates physical conditioning with mental recovery and emotional equilibrium. Through structured movement, the individual learns to coordinate physical and psychological responses, using physical action as a method to enhance attentional control. Exercise therapy therefore represents not only a method of training but a philosophy of balance that strengthens resilience, reduces stress, and renews self-confidence. This chapter explores the foundations, mechanisms, and practical implications of exercise therapy as a pathway to psychophysiological resilience.

5.1. Overview of exercise-based interventions

Exercise therapy refers to systematic physical activity that is used for therapeutic purposes. It may include aerobic practices such as walking, swimming, or cycling, as well as gentle meditative movements like yoga or tai chi. Unlike competitive sport, its goal is restoration and rehabilitation. Each form of exercise can enhance mindfulness by connecting breathing, posture, and perception [101].

Within psycho-oncology, exercise therapy functions as both prevention and rehabilitation. For healthy individuals, it can enhance vitality and emotional stability; for patients in recovery, it aids in rebuilding confidence in their bodies post-treatment. Regular physical activity improves energy levels, circulation, and muscle coordination while also helping to alleviate emotional tension. For individuals who experience anxiety about illness, exercise can reduce fear and help individuals shift from uncertainty to a more regulated emotional state [102].

The essence of exercise therapy lies not in intensity but in the rhythm of practice. Consistency establishes a beneficial dialogue between effort and rest, stabilizing both physiological systems and emotional states. Over time, the body becomes familiar with activation and recovery patterns, developing adaptive skills that can support functioning in daily activities [103].

5.2. Physiological foundations

The physiological foundation of exercise therapy lies in the cyclical pattern of activation and recovery that characterises human physiology. Every movement creates a sequence of effort, adaptation, and recovery. This sequence strengthens the circulatory, respiratory, and neuromuscular systems while simultaneously training the body to regulate stress. Physical movement serves as both a biological process and a behavioral model for emotional balance [104].

During moderate activity, the heart rate increases and breathing deepens, improving oxygen delivery to tissues and the brain. After exercise, the body enters a recovery phase that activates parasympathetic pathways and supports physiological restoration. Repetition of this rhythm across exercise sessions teaches the nervous system to respond to stress and return smoothly to a state of calm. Regular exercise enhances immune function, stabilizes hormonal cycles, and promotes restorative sleep. These physiological adjustments contribute to overall psychological resilience [105]. Evidence from cancer care indicates that Arts-Based Therapy therapy can reduce stress and improve emotional functioning, as demonstrated in a study where patients engaging in structured gardening activities reported significant mood improvement [106].

The multidimensional effects of exercise therapy can be summarized across physical, emotional, cognitive, and social domains. **Table 2** presents these outcomes in relation to their underlying mechanisms and interpretive value within psycho oncological care.

Table 2. Summary of core outcomes and mechanisms of exercise therapy. A synthesised summary of the physical, emotional, cognitive, social, and ecological effects of exercise therapy, with associated mechanisms and interpretive value for psycho oncological care.

Domain	Primary outcome	Underlying mechanism	Interpretation in psycho-oncological context
Physical Regulation	Improved circulation, muscle strength, and flexibility	Rhythmic activation of cardiovascular and respiratory systems	Restores energy and body confidence after treatment or fatigue
Immune and Endocrine Balance	Enhanced immune surveillance and hormonal stability	Regular moderate activity stimulates regulatory feedback	Reduces chronic stress load and promotes recovery readiness
Emotional Stability	Decrease in anxiety and tension, greater calmness	Controlled exertion followed by relaxation	Teaches stress management through bodily rhythm
Cognitive Clarity	Better focus, memory, and decision-making	Activation of attention and executive control networks	Enhances concentration and self-awareness
Self-Efficacy	Increased confidence and motivation	Repetition of achievable movement goals	Transforms uncertainty into constructive action
Social Connection	Belonging, empathy, and mutual support	Synchronization of rhythm and shared goals in group exercise	Converts individual practice into communal resilience
Ecological Integration	Awareness of environment and sustainability	Outdoor movement and sensory contact with nature	Aligns human vitality with ecological balance

Exercise therapy functions as a bridge between physiology and emotion. When practiced consistently, it promotes coherence among physiological systems, which can lead to improved psychological well-being. For example, exercise has been shown to enhance circulation and support mental clarity; it can influence hormone levels that

sustain mood stability; and it may augment immune responses, contributing to a sense of overall well-being [107].

Rhythmic movement and recovery can increase an individual's confidence in their ability to respond to stress. For those coping with health challenges, this can be transformative, reducing feelings of vulnerability and improving awareness of physical and psychological integration. In the context of preventive psycho-oncology, this embodied understanding fosters the belief that resilience is not merely a trait but a learned behavior through regulatory practices [108].

5.3. Psychological and behavioral mechanisms

Exercise therapy also functions as a form of emotional and cognitive regulation. Each session begins with activation, proceeds through sustained effort, and ends with recovery. This natural cycle trains the mind to adapt to challenge and to release tension afterward. The sequence of activation and recovery parallels psychological processes involved in resilience [109].

Mindful exercise integrates attention with motion. When individuals concentrate on breathing, rhythm, and bodily sensation, they enter a state of clear awareness that reduces anxiety and distraction. Attention becomes more focused and less disrupted by intrusive thoughts. This alignment produces calm energy and improved focus [110].

Self-efficacy is another mechanism of transformation. Each completed exercise confirms capability and progress. The resulting confidence strengthens motivation, which in turn sustains continued practice. Over time, exercise becomes self-reinforcing; it shifts from obligation to preference, from effort to enjoyment. Through this shift, participants internalise self-management strategies that support ongoing regulation [111].

5.4. Social and ecological dimensions

Exercise is often enhanced when practiced in community settings. Group activities create shared rhythm and emotional connections among participants. Those who move together can develop a sense of belonging and empathy, as well as enhanced motivation and persistence. Group synchrony can increase motivation and create supportive social interaction, which can alleviate feelings of isolation and help prevent emotional fatigue [112].

Outdoor exercise further enriches this experience by connecting physical activity to the natural environment. The presence of light, air, and open space can deepen relaxation. Natural scenery may enhance engagement and support emotional stability. Engaging in activities such as walking in green areas or practicing slow movements near water can enhance sensory engagement, which supports mental recovery. This interplay of exercise and ecological awareness allows individuals to understand health within a broader environmental context, supporting awareness of both personal health and environmental conditions [113].

5.5. Implementation and future integration

In clinical settings, structured exercise programs help patients rebuild strength and emotional confidence. Activities such as walking or stretching under professional

supervision allow safe participation and gradual improvement [114]. Educational institutions can integrate short exercise sessions into daily schedules to promote concentration and reduce stress.

Community initiatives extend these benefits to wider populations through outdoor classes and group walks, reinforcing both social connection and environmental care. As indicated conceptually, when physical activity is supported by social interaction, health related behaviours become socially supported rather than individually isolated [115]. Future research combining physiological data with reflective self-reports will clarify how movement contributes to psychological resilience and social participation.

6. Integrative perspectives, recommendations, and future directions

The previous chapters show that Arts-Based Therapy therapy and exercise therapy share a single conceptual foundation grounded in rhythm, awareness, and participation. Both connect the individual with the natural order and encourage balance between physical vitality and psychological calm. Arts-Based Therapy therapy nurtures relationship with the living environment through care and observation, while exercise therapy awakens awareness through coordinated movement. Together these approaches present an integrated model of ecological and psychophysiological healing that unites prevention, rehabilitation, and personal growth.

The integration of Arts-Based Therapy and exercise therapy demonstrates that prevention and recovery are not opposing phases but continuous expressions of adaptation. Engagement with natural surroundings can restore sensory and emotional stability, while purposeful movement enhances self-regulation and inner rhythm. When practiced together, these experiences can strengthen concentration, resilience, and empathy, transforming health into a dynamic partnership between the individual and their environment. In psycho-oncology, this approach shifts the focus of care from merely reducing symptoms to cultivating resilience and meaningful engagement in life activities [116].

Both forms of therapy operate through experiential learning rather than direct instruction. They foster direct interaction with living systems and bodily rhythms, promoting awareness and mindfulness. Integrated programs combining gardening with mindful movement in hospitals, schools, and communities create renewal spaces that connect individuals with themselves, others, and their environment. Within these settings, healing is reconceptualized, shifting from merely eliminating distress to restoring harmony [117,118].

6.1. Recommendations

The translation of this integrative framework into practice requires collaboration among healthcare professionals, educators, community leaders, and policymakers as summarize in **Table 3**. Hospitals and rehabilitation centers can incorporate gardens and exercise areas that encourage participation and reflection. Health professionals should view these environments as complementary settings for psychological and physical recovery rather than as decorative additions [119]. Short, structured activities

such as guided horticulture sessions or low intensity walking groups can support consistent engagement.

Table 3. Recommendations for integrative psycho oncological practice. A summary of recommended actions across clinical practice, education, community involvement, research, and policy.

Area of focus	Recommendation	Expected outcome
Clinical Practice	Incorporate therapeutic gardens, open air spaces, and supervised movement programs into hospital and rehabilitation design	Promotes physical recovery, emotional stability, and patient participation
Professional Training	Integrate ecological health, body awareness, and movement therapy modules into psycho-oncology education	Builds practitioner empathy and skill through experiential learning
Community Engagement	Establish community gardens and public exercise spaces as preventive health environments	Strengthens social connection, cooperation, and environmental responsibility
Research and Evaluation	Conduct longitudinal and interdisciplinary studies combining physiological and psychological data	Provides evidence of effectiveness and clarifies therapeutic mechanisms
Policy Development	Recognise ecological and physical activity as essential components of national health planning	Ensures institutional support, sustainability, and equitable access

Education is another foundation for sustainable progress. Universities and training institutions that prepare professionals in psycho-oncology should include ecological health, body awareness, and therapeutic movement as core subjects. Research and evaluation will continue to build evidence. Practical modules that involve gardening, mindfulness, or controlled exercise would allow future practitioners to understand the lived experience of balance before guiding others toward it [120]. This experiential form of education produces empathy and insight that cannot be learned through theory alone.

Community participation must also be encouraged. Public gardens, green corridors, and community movement programs can function as preventive health environments that reduce isolation and strengthen social connection. These spaces remind people that health is a shared responsibility supported by cooperation and environment [121]. The rhythm of growth and movement experienced collectively creates a sense of belonging that sustains motivation for well-being.

Research and evaluation will give credibility to this growing field. Systematic studies that combine physiological indicators such as immune response or heart rhythm with psychological assessments of mood and resilience will deepen understanding of how ecological and physical activity influence adaptation. Integrating quantitative and qualitative approaches will reveal how meaning and biology interact within the healing process [122].

Finally, policy development is essential to make these programs accessible and sustainable. Health authorities should recognize the value of nature-based and movement-based therapies as part of national wellness strategies. Investment in green infrastructure, public exercise facilities, and professional training supports both human and environmental resilience. Policy that views ecological health and mental health as interdependent will lay the foundation for a more compassionate and sustainable healthcare system [123].

6.2. Future directions

Future progress in integrative psycho-oncology will require coordinated innovation and interdisciplinary collaboration. **Table 4** summarises priority areas for development. Research should clarify the biological and psychological pathways linking Arts-Based Therapy activity and structured exercise with stress regulation, immune function, sleep, and emotional outcomes in oncology populations. Longitudinal and controlled studies are needed to establish optimal intervention dosage and duration.

Table 4. Future directions for integrative psycho-oncological care. Future directions for integrative psycho-oncological care. A summary of priority development areas including scientific research, digital innovation, sustainable design, cultural adaptation, and policy expansion.

Domain	Focus of development	Objective	Expected impact
Scientific Research	Exploration of neural, physiological, and immune pathways linking movement and nature exposure with emotional regulation	Establish evidence for the biological basis of ecological and psychophysiological therapy	Strengthens scientific legitimacy and guides clinical application
Technological Innovation	Development of digital and virtual environments that simulate ecological and exercise experiences	Increase accessibility for individuals with mobility or geographical limitations	Expands therapeutic reach while maintaining connection and reflection
Design and Sustainability	Integration of gardens, green corridors, and open-air spaces into hospitals, schools, and workplaces	Create healing landscapes that combine beauty, functionality, and therapeutic purpose	Enhances environmental quality and supports daily preventive practice
Cultural Adaptation	Inclusion of local traditions of movement, gardening, and mindfulness in program design	Ensure authenticity and acceptance within diverse populations	Promotes inclusiveness and cultural continuity in therapeutic practice
Policy and Governance	Recognition of ecological and physical activity as part of national health planning	Embed integrative therapy in preventive and rehabilitative healthcare structures	Builds long term sustainability through institutional support

Technology may expand accessibility through virtual gardens and guided exercise applications, supporting individuals with mobility limitations or limited access to in person programs. Institutional planning can incorporate therapeutic green spaces and accessible movement areas into healthcare, educational, and community environments, using designs that accommodate diverse physical abilities and minimise maintenance demands.

Cultural adaptation is essential, as integrating locally familiar movement and gardening practices may improve engagement. Policy frameworks recognising ecological and physical activity as components of national health strategies can support standardisation, training, and safety requirements. Investment in green infrastructure and public movement facilities will help broaden access and reinforce preventive health initiatives.

7. Limitations

This review is narrative in nature and does not include a systematic search or meta-analysis, which limits the ability to compare effect sizes across studies. The available evidence for Arts-Based Therapy and exercise therapy is drawn from heterogeneous populations, and many studies include small sample sizes or pilot designs, particularly in oncology settings. Cultural differences and variability in

exercise adherence may influence how individuals respond to these interventions. In addition, oncology specific research on Arts-Based Therapy therapy remains limited, reducing the generalisability of conclusions. These constraints highlight the need for larger, controlled, and culturally sensitive studies to strengthen the evidence base in psycho-oncology.

8. Conclusion

This review examined how Arts-Based Therapy therapy and exercise therapy contribute to psychophysiological regulation through ecological engagement and structured movement. The evidence indicates that both approaches support preventive and restorative processes by enhancing attention, emotional regulation, and physical functioning. Their combined application provides a coherent framework for strengthening resilience and promoting adaptive responses in individuals at potential risk of cancer.

Engagement with natural environments and participation in guided physical activity can stabilise mood, reduce stress, and improve functional capacity. These interventions offer complementary pathways for supporting psychological wellbeing and promoting recovery, extending the scope of psycho-oncology beyond symptom management toward broader preventive care. Integrated programs in clinical, educational, and community settings may enhance coping resources, improve patient experience, and reinforce health-promoting behaviours.

The findings suggest that ecological and movement-based interventions represent feasible, low risk strategies that can be incorporated into supportive care models. Gardens, open air spaces, and structured exercise sessions may serve as practical components of comprehensive cancer prevention and survivorship programs. Continued research is needed to refine implementation, evaluate long term outcomes, and determine their relevance across diverse cultural and clinical populations.

Funding: This research received no external funding.

Ethical approval: Not applicable.

Informed consent statement: Not applicable.

Acknowledgments: Not applicable.

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

References

1. Pichardo CM, Dwyer LA, Ferrer RA, et al. The association of context with reported self-efficacy for cancer-preventive behaviors and perceived cancer risk in us adults from the Midlife in the United States (MIDUS) study. *International Journal of Environmental Research and Public Health*. 2024; 21(1): 62. doi: 10.3390/ijerph21010062
2. Siegel RL, Miller KD, Fuchs HE, Jemal A. Cancer statistics, 2022. *CA: A Cancer Journal for Clinicians*. 2022; 72(1): 7–33. doi: 10.3322/caac.21708
3. Paslaru AM, Plesea-Condratovici A, Moroianu LA, et al. Mind over malignancy: A Systematic review and meta-analysis of psychological distress, coping, and therapeutic interventions in oncology. *Medicina*. 2025; 61(6): 1086. doi: 10.3390/medicina61061086

4. Akinyemiju T, Ogunsina K, Gupta A, et al. A socio-ecological framework for cancer prevention in low and middle-income countries. *Frontiers in Public Health*. 2022; 10: 884678. doi: 10.3389/fpubh.2022.884678
5. Gomez SL, Shariff-Marco S, DeRouen M, et al. The impact of neighborhood social and built environment factors across the cancer continuum: current research, methodological considerations, and future directions. *Cancer*. 2015; 121(14): 2314-2330. doi: 10.1002/cncr.29345
6. Sung H, Ferlay J, Siegel RL, et al. Global cancer statistics 2020: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. *CA: A Cancer Journal for Clinicians*. 2021; 71(3): 209-249. doi: 10.3322/caac.21660
7. Subramaniam S, Kong YC, Chinna K, et al. Health-related quality of life and psychological distress among cancer survivors in a middle-income country. *Psycho-Oncology*. 2018; 27(9): 2172-2179. doi: 10.1002/pon.4787
8. Simonelli LE, Siegel SD, Duffy NM. Fear of cancer recurrence: a theoretical review and its relevance for clinical presentation and management. *Psycho-Oncology*. 2017; 26(10): 1444-1454. doi: 10.1002/pon.4168
9. Lee K, Kim S, Lee H, et al. The Process of Cancer Prevention Behaviors in Individuals at High Risk of Hereditary Cancer: A Grounded Theory Study. *Psycho-Oncology*. 2025; 34(8): e70246. doi: 10.1002/pon.70246
10. Brand H, Speiser D, Besch L, et al. Making sense of a health threat: Illness representations, coping, and psychological distress among BRCA1/2 mutation carriers. *Genes*. 2021; 12(5): 741. doi: 10.3390/genes12050741
11. Smith AB, Sharpe L, Thewes B, et al. Medical, demographic and psychological correlates of fear of cancer recurrence (FCR) morbidity in breast, colorectal and melanoma cancer survivors with probable clinically significant FCR seeking psychological treatment through the ConquerFear study. *Supportive Care in Cancer*. 2018; 26(12): 4207-4216. doi: 10.1007/s00520-018-4294-y
12. Alazwari IAH, Alarsan S, Alkhateeb NA, et al. Designing effective health education programs: a review of current research and best practices. *Health Sciences*. 2023; 12(2): 42-46. doi: 10.56936/18290825-2023.17.2-105
13. Hlupeni A, Khan WJ, Adejola A, et al. Fear of fragility: A case of osteoporosis-triggered takotsubo cardiomyopathy. *Cureus*. 2024; 16(12). doi: 10.7759/cureus.75289
14. Vetter M. Boosting immunity and enhancing wellbeing: The transformative impact of supportive care on cancer outcomes. *Cancer*. 2023; 18(4). doi: 10.36000/hbt.oh.2023.18.125
15. Sadeghi H. Hypnotherapy and purge emotional writing for chronic disease management. *The Medical Journal of Southern California Clinicians*. 2023; 16(1).
16. Cempaka AA, Maryuti IA, Prasetyani AG. Stress management health education and relaxation therapy training for children and adolescents in Saint Beatrix Orphanage Sidoarjo. *Bubungan Tinggi: Jurnal Pengabdian Masyarakat*. 2022; 4(2): 344. doi: 10.20527/btjpm.v4i2.5126
17. Monteiro F, Pereira M, Canavarro MC, et al. Be a mom's efficacy in enhancing positive mental health among postpartum women presenting low risk for postpartum depression: results from a pilot randomized trial. *International Journal of Environmental Research and Public Health*. 2020; 17(13): 4679. doi: 10.3390/ijerph17134679
18. Meisner J, McLeland-Wieser H, Traylor EE, et al. Relational One Health: A more-than-biomedical framework for more-than-human health, and lessons learned from Brazil, Ethiopia, and Israel. *One Health*. 2024; 18: 100676. doi: 10.1016/j.onehlt.2024.100676
19. Yesilaydin G, Donar GB. Relationship Between Environmental Health and Health Status Indicators: A Canonical Correlation Analysis Approach. *Journal of Health Management*. 2025. doi: 10.1177/09720634251341009
20. Slawsky ED, Hoffman JC, Cowan KN, et al. Beneficial use impairments, degradation of aesthetics, and human health: A review. *International Journal of Environmental Research and Public Health*. 2022; 19(10): 6090. doi: 10.3390/ijerph19106090
21. Rowley K, Doyle J, Johnston L, et al. Strengths and limitations of a tool for monitoring and evaluating First Peoples' health promotion from an ecological perspective. *BMC Public Health*. 2015; 15(1): 1215. doi: 10.1186/s12889-015-2550-3
22. De Garine-Wichatitsky M, Binot A, Ward J, et al. "Health in" and "Health of" social-ecological systems: A practical framework for the management of healthy and resilient agricultural and natural ecosystems. *Frontiers in Public Health*. 2021; 8: 616328. doi: 10.3389/fpubh.2020.616328
23. Khan MS, Rothman-Ostrow P, Spencer J, et al. The growth and strategic functioning of One Health networks: a systematic analysis. *The Lancet Planetary Health*. 2018; 2(6): e264-e273. doi: 10.1016/s2542-5196(18)30084-6

24. Patrick R, Henderson-Wilson C, Ebdon M. Exploring the co-benefits of environmental volunteering for human and planetary health promotion. *Health Promotion Journal of Australia*. 2022; 33(1): 57-67. doi: 10.1002/hpja.460
25. Spratt SE, Batch BC, Davis LP, et al. Methods and initial findings from the Durham Diabetes Coalition: integrating geospatial health technology and community interventions to reduce death and disability. *Journal of Clinical & Translational Endocrinology*. 2015; 2(1): 26-36. doi: 10.1016/j.jcte.2014.10.006
26. Liu M, Liu H, Qin Z, et al. Effects of physical activity on depression, anxiety, and stress in college students: the chain-based mediating role of psychological resilience and coping styles. *Frontiers in Psychology*. 2024; 15: 1396795. doi: 10.3389/fpsyg.2024.1396795
27. Al Kubaisy W, Mohamad M, Ismail Z, et al. Man's and woman's motivation to exercise. *Asian Journal of Quality of Life*. 2017; 2(8): 35-43. doi: 10.21834/AJQOL.V2I8.68
28. Merchant RA, Chan YH, Hui RJY, et al. Possible sarcopenia and impact of dual-task exercise on gait speed, handgrip strength, falls, and perceived health. *Frontiers in Medicine*. 2021; 8: 660463. doi: 10.3389/fmed.2021.660463
29. Shiri R, Falah-Hassani K. Does leisure time physical activity protect against low back pain? Systematic review and meta-analysis of 36 prospective cohort studies. *British Journal of Sports Medicine*. 2017; 51(19): 1410-1418. doi: 10.1136/bjsports-2016-097352
30. Williams T, Barnwell GC, Stein DJ. A systematic review of randomised controlled trials on the effectiveness of ecotherapy interventions for treating mental disorders. *MedRxiv*. 2020. doi: 10.1101/2020.09.25.20201525
31. Soga M, Gaston KJ, Yamaura Y. Gardening is beneficial for health: A meta-analysis. *Preventive Medicine Reports*. 2017; 5: 92-99. doi: 10.1016/j.pmedr.2016.11.007
32. Murroni V, Cavalli R, Basso A, et al. Effectiveness of therapeutic gardens for people with dementia: A systematic review. *International Journal of Environmental Research and Public Health*. 2021; 18(18): 9595. doi: 10.3390/ijerph18189595
33. Kim MY, Park WK. Effect of Horticultural Occupation Therapy Program on the Emotional Rehabilitation of Acute and Chronic Mental Disorder Patients. *Journal of People, Plants, and Environment*. 2018; 21(1): 27–35. doi: 10.11628/ksppe.2018.21.1.027
34. Song C, Ikei H, Kagawa T, et al. Physiological and psychological effects of viewing forests on young women. *Forests*. 2019; 10(8): 635. doi: 10.3390/f10080635
35. Krzeptowska-Moszkowicz I, Moszkowicz Ł, Porada K. Evolution of the concept of sensory gardens in the generally accessible space of a large city: Analysis of multiple cases from Kraków (Poland) using the therapeutic space attribute rating method. *Sustainability*. 2021; 13(11): 5904. doi: 10.3390/su13115904
36. Pálsdóttir AM, Spendrup S, Mårtensson L, et al. Garden smellscape—experiences of plant scents in a nature-based intervention. *Frontiers in Psychology*. 2021; 12: 667957. doi: 10.3389/fpsyg.2021.667957
37. Kondo MC, Fluehr JM, McKeon T, et al. Urban green space and its impact on human health. *International Journal of Environmental Research and Public Health*. 2018; 15(3): 445. doi: 10.3390/ijerph15030445
38. Nejade RM, Grace D, Bowman LR. What is the impact of nature on human health? A scoping review of the literature. *Journal of Global Health*. 2022; 12: 04099. doi: 10.7189/jogh.12.04099
39. Coventry PA, Neale C, Dyke A, et al. The mental health benefits of purposeful activities in public green spaces in urban and semi-urban neighbourhoods: A mixed-methods pilot and proof of concept study. *International Journal of Environmental Research and Public Health*. 2019; 16(15): 2712. doi: 10.3390/ijerph16152712
40. Castilla DG, Durano KD, Megabon MC, et al. Analytical hierarchal process of environmental ethics decision making for environmental sustainability. *International Journal of Science and Research Archive*. 2024; 12(1): 2081-2091. doi: 10.30574/ijrsra.2024.12.1.0982
41. Dodd T, Cheong CS, Hoffmann A, et al. Toward sustainable automobility: Insights from a stewardship literature review of the industry. *Business Strategy and the Environment*. 2024; 33(6): 5028-5050. doi: 10.1002/bse.3736
42. Herrmann T, Bettmann JE, Hanley A, et al. Comparison of indoor versus outdoor mindfulness interventions for veterans: A pilot randomized controlled trial. *Psychological Services*, 2025. doi: 10.1037/ser0000976
43. Shanahan DF, Astell-Burt T, Barber EA, et al. Nature-based interventions for improving health and wellbeing: The purpose, the people and the outcomes. *Sports*. 2019; 7(6): 141. doi: 10.3390/sports7060141
44. Gismero-González E, Bermejo-Toro L, Cagigal V, et al. Emotional impact of COVID-19 lockdown among the Spanish population. *Frontiers in Psychology*. 2020; 11: 616978. doi: 10.3389/fpsyg.2020.616978

45. Arisoy N. The healing power of ecosystem services and ecotherapy: Exploring the synergies between nature's benefits and therapeutic interventions. *Biodiversity Studies*. 2023; 2(1): 29-35. doi: 10.56494/bist.2023.14
46. Noone S, Innes A, Kelly F, et al. 'The nourishing soil of the soul': The role of horticultural therapy in promoting well-being in community-dwelling people with dementia. *Dementia*. 2017; 16(7): 897-910. doi: 10.1177/1471301215623889
47. Kim YJ, Choi SW, Park SA. Effects of Tactile Stimulation using an assortment of natural elements on the psychophysiological responses of adults. *Horticulturae*. 2023; 9(12): 1293. doi: 10.3390/horticulturae9121293
48. He M, Hu Y, Dong X, et al. Research on Companion-Based Forest Therapy and Its Physiological and Psychological Benefits to College Students. *International Journal of Environmental Research and Public Health*. 2025; 22(7): 1026. doi: 10.3390/ijerph22071026
49. Jenkins M, Egger S. Psychological Integrity and Ecological Repair: The Impact on Planetary Public Mental Health (A Narrative Review). *International Journal of Environmental Research and Public Health*. 2025; 22(10): 1586. doi: 10.3390/ijerph22101586
50. Fitzpatrick S, Nolan RD, Hallam JS, et al. Ecological grief in the Fernald Community Cohort: A pilot study. *PLOS Mental Health*. 2024; 1(1): e0000049. doi: 10.1371/journal.pmen.0000049
51. Fountoulakis G, Alkhouri KI. The ecological self: Integrating environmental psychology, ecopsychology, and ecotheology in the anthropocene. *Environmental Education for Sustainability*. 2024; 6(1): 22-35. doi: 10.12681/ees.38255
52. Ríos-Rodríguez ML, Rosales C, Hernández B, et al. Benefits for emotional regulation of contact with nature: a systematic review. *Frontiers in Psychology*. 2024; 15: 1402885. doi: 10.3389/fpsyg.2024.1402885
53. Bergenheim A, Ahlborg Jr G, Bernhardsson S. Nature-based rehabilitation for patients with long-standing stress-related mental disorders: a qualitative evidence synthesis of patients' experiences. *International Journal of Environmental Research and Public Health*. 2021; 18(13): 6897. doi: 10.3390/ijerph18136897
54. Goldin PR, Gross JJ. Effects of mindfulness-based stress reduction (MBSR) on emotion regulation in social anxiety disorder. *Emotion*. 2010; 10(1): 83. doi: 10.1037/a0018441
55. Bernstein EE, Curtiss JE, Wu GWY, et al. Exercise and emotion dynamics: An experience sampling study. *Emotion*. 2019; 19(4): 637. doi: 10.1037/emo0000462
56. Grecucci A, Pappaianni E, Siugzdaite R, et al. Mindful emotion regulation: Exploring the neurocognitive mechanisms behind mindfulness. *BioMed Research International*. 2015; 2015(1): 670724. doi: 10.1155/2015/670724
57. La Torre G, Raffone A, Peruzzo M, et al. Yoga and mindfulness as a tool for influencing affectivity, anxiety, mental health, and stress among healthcare workers: results of a single-arm clinical trial. *Journal of Clinical Medicine*. 2020; 9(4): 1037. doi: 10.3390/jcm9041037
58. Black DS, Slavich GM. Mindfulness meditation and the immune system: a systematic review of randomized controlled trials. *Annals of the New York Academy of Sciences*. 2016; 1373(1): 13-24. doi: 10.1111/nyas.12998
59. Valladolid VC. The role of coping strategies in the resilience and well-being of college students during COVID-19 pandemic. *Philippine Social Science Journal*. 2021; 4(2): 30-42. doi: 10.52006/main.v4i2.342
60. Joyce S, Shand F, Tighe J, et al. Road to resilience: a systematic review and meta-analysis of resilience training programmes and interventions. *BMJ Open*. 2018; 8(6): e017858. doi: 10.1136/bmjopen-2017-017858
61. Zhang JY, Ji XZ, Fan YN, et al. Emotion management for college students: effectiveness of a mindfulness-based emotion management intervention on emotional regulation and resilience of college students. *The Journal of Nervous and Mental Disease*. 2022; 210(9): 716-722. doi: 10.1097/NMD.0000000000001484
62. Jiang Y, Yi Z, Yao Y, et al. Effects of college students' mindfulness on depression symptoms during the epidemic prevention and control period: The mediating effect of psychological resilience. *Frontiers in Psychiatry*. 2023; 13: 991449. doi: 10.3389/fpsyg.2022.991449
63. Deng L, Wu Q, Ding F, et al. The effect of telemedicine on secondary prevention of atherosclerotic cardiovascular disease: A systematic review and meta-analysis. *Frontiers in Cardiovascular Medicine*. 2022; 9: 1020744. doi: 10.3389/fcvm.2022.1020744
64. Shebib R, Bailey JF, Smittenaar P, et al. Randomized controlled trial of a 12-week digital care program in improving low back pain. *NPJ Digital Medicine*. 2019; 2(1): 1. doi: 10.1038/s41746-018-0076-7
65. Geller KS, Melbye MJ, Rosenkranz RR, et al. Measuring elementary-aged children's self-efficacy and proxy efficacy for gardening and related health behaviors. *HortTechnology*. 2015; 25(6): 731-741. doi: 10.21273/HORTTECH.25.6.731

66. Toros T, Ogras EB, Toy AB, et al. The impact of regular exercise on life satisfaction, self-esteem, and self-efficacy in older adults. *Behavioral Sciences*. 2023; 13(9): 714. doi: 10.3390/bs13090714
67. Herts KL, Khaled MM, Stanton AL. Correlates of self-efficacy for disease management in adolescent/young adult cancer survivors: A systematic review. *Health Psychology*. 2017; 36(3): 192. doi: 10.1037/hea0000446
68. Zhang CQ, Zhang R, Schwarzer R, et al. A meta-analysis of the health action process approach. *Health Psychology*. 2019; 38(7): 623. doi: 10.1037/hea0000728
69. Babazadeh T, Ranjbaran S, Pourrazavi S, et al. Self-efficacy, self-esteem, and happiness in older adults: A cross-sectional study. *PLoS One*. 2025; 20(3): e0319269. doi: 10.1371/journal.pone.0319269
70. Sakuma S, Kimpura K, Kawai Y, et al. Integrating Physical Therapy and Virtual Reality to Manage Pain-Related Fear of Movement in Patients With Chronic Pain: A Randomized Controlled Trial. *Cureus*. 2025; 17(2). doi: 10.7759/cureus.79551
71. Coventry PA, Brown JVE, Pervin J, et al. Nature-based outdoor activities for mental and physical health: Systematic review and meta-analysis. *SSM-Population Health*. 2021; 16: 100934. doi: 10.1016/j.ssmph.2021.100934
72. Smith R, Moutoussis M, Bilek E. Simulating the computational mechanisms of cognitive and behavioral psychotherapeutic interventions: Insights from active inference. *Scientific Reports*. 2021; 11(1): 10128. doi: 10.31234/osf.io/8m62p
73. Qonita Q, Mariyati LI. Horticultural Therapy to Improve Self-Confidence in the Elderly: Terapi Hortikultura untuk Meningkatkan Rasa Percaya Diri pada Lansia. *Indonesian Journal on Health Science and Medicine*. 2025; 2(2). doi: 10.21070/ijhsm.v2i2.276
74. Heród A, Szewczyk-Taranek B, Pawłowska B. Therapeutic horticulture as a potential tool of preventive geriatric medicine improving health, well-being and life quality—a systematic review. *Folia Horticulturae*. 2022; 34(1): 85-104. doi: 10.2478/fhort-2022-0008
75. Hamilton EM. Green building, green behavior? An analysis of building characteristics that support environmentally responsible behaviors. *Environment and Behavior*. 2021; 53(4): 409-450. doi: 10.1177/0013916520942601
76. Tutova H, Kunakh O, Zhukov O. Restorative landscapes in urban green infrastructure: The ecological and psychosocial roles of horticultural therapy. *Agrology*. 2025; 8(2): 78-88. doi: 10.32819/202511
77. Collins SA, McDonnell AS, Scott EE, et al. Nature imagery's influence on ERN amplitude: an examination of Attention Restoration Theory using EEG. *Frontiers in Human Neuroscience*. 2025; 19: 1567689. doi: 10.3389/fnhum.2025.1567689
78. Cakir G, Isik U, Ustun UD, et al. Resilience among Turkish adolescents: A multi-level approach. *PLoS One*. 2024; 19(7): e0300165. doi: 10.1371/journal.pone.0300165
79. Neumann RJ, Ahrens KF, Kollmann B, et al. The impact of physical fitness on resilience to modern life stress and the mediating role of general self-efficacy. *European Archives of Psychiatry and Clinical Neuroscience*. 2022; 272(4): 679-692. doi: 10.1007/s00406-021-01338-9
80. Chen M, Huang L, Qin Q, et al. Impact of expressive suppression on subthreshold depression among college students: a moderated mediation model. *Frontiers in Psychology*. 2025; 16: 1678275. doi: 10.3389/fpsyg.2025.1678275
81. Abenoja A, Theodorlis M, Ahluwalia V, et al. Strategies to improve equitable access to early osteoarthritis diagnosis and management: an updated review. *Arthritis Care & Research*. 2025; 77(2): 218-227. doi: 10.1002/acr.25179
82. Van Erp RMA, Jelsma J, Huijnen IPI, et al. Spinal surgeons' opinions on pre-and postoperative rehabilitation in patients undergoing lumbar spinal fusion surgery: a survey-based study in the Netherlands and Sweden. *Spine*. 2018; 43(10): 713-719. doi: 10.1097/BRS.0000000000002406
83. Merellano-Navarro E, Pasten-Hernández P, Aristegui-Mondaca J, et al. Association between physical activity, quality of life, barriers to physical activity, and mental health in Chilean adolescents: The MOV-ES Study. *Healthcare*. 2025; 13(16): 2028. doi: 10.3390/healthcare13162028
84. Cameron EE, Joyce KM, Delaquis CP, et al. Maternal psychological distress & mental health service use during the COVID-19 pandemic. *Journal of Affective Disorders*. 2020; 276: 765-774. doi: 10.1016/j.jad.2020.07.081
85. Nakau M, Imanishi J, Imanishi J, et al. Spiritual care of cancer patients by integrated medicine in urban green space: a pilot study. *Explore*. 2013; 9(2): 87-90. doi: 10.1016/j.explore.2012.12.002
86. Hsieh CH, Chen CM, Yang JY, et al. The effects of immersive garden experience on the health care to elderly residents with mild-to-moderate cognitive impairment living in nursing homes after the COVID-19 pandemic. *Landscape and Ecological Engineering*. 2022; 18(1): 45-56. doi: 10.1007/s11355-021-00480-9
87. Bao H. Intervention effect of mindfulness-based cognitive therapy on diabetes-related distress and self-care. *Iranian Journal of Public Health*. 2022; 51(3): 606. doi: 10.18502/ijph.v51i3.8937

88. Kilian M, Paluch M. Human Self-Experience in the Garden: Horticulture from an Ontological-Axiological Perspective. *Studia Ecologiae et Bioethicae*. 2023; 21(3): 7-18.
89. Kroustos KR, Horning G, Gurevich J, et al. Remembering your roots: The role of horticulture therapy in people living with dementia. *Ohio Journal of Public Health*. 2020; 3(1): 40-44. doi: 10.18061/ojph.v3i1.9020
90. Rzeszotarska-Palka M. Sensory gardens on university campuses: a case study. *Space & Form*. 2024; 60: 321-338. doi: 10.21005/pif.2024.60.D-02
91. Chakrapani K, Kalpana B. Utilization of horticultural crops as natural stimulants to enhance sleep quality in healthcare nursing workers engaged in night shifts. *Journal of Applied Horticulture*. 2025; 27(3): 396-401. doi: 10.37855/jah.2025.v27i03.73
92. Howarth M, Brettell A, Hardman M, et al. What is the evidence for the impact of gardens and gardening on health and well-being: a scoping review and evidence-based logic model to guide healthcare strategy decision making on the use of gardening approaches as a social prescription. *BMJ Open*. 2020; 10(7): e036923. doi: 10.1136/bmjopen-2020-036923
93. Alaimo K, Beavers AW, Crawford C, et al. Amplifying health through community gardens: A framework for advancing multicomponent, behaviorally based neighborhood interventions. *Current Environmental Health Reports*. 2016; 3(3): 302-312. doi: 10.1007/s40572-016-0105-0
94. Zhao Y, Liu Y, Wang Z. Effectiveness of horticultural therapy in people with dementia: A quantitative systematic review. *Journal of Clinical Nursing*. 2022; 31(13-14): 1983-1997. doi: 10.1111/jocn.15204
95. Atta MHR, Salama EAA, Menessy RFM. Effect of Horticultural Therapy Program on Psychological Wellbeing, Hope and Social Adjustment Among Patients With Psychotic Disorders: A Nursing Perspective. *Journal of Psychiatric and Mental Health Nursing*. 2025. doi: 10.1111/jpm.13180
96. Panțiru I, Ronaldson A, Sima N, et al. The impact of gardening on well-being, mental health, and quality of life: an umbrella review and meta-analysis. *Systematic Reviews*. 2024; 13(1): 45. doi: 10.1186/s13643-024-02457-9
97. Lu LC, Lan SH, Hsieh YP, et al. Horticultural therapy in patients with dementia: A systematic review and meta-analysis. *American Journal of Alzheimer's Disease & Other Dementias*. 2020; 35: 1533317519883498. doi: 10.1177/1533317519883498
98. Tu HM, Chiu PY. Meta-analysis of controlled trials testing horticultural therapy for the improvement of cognitive function. *Scientific Reports*. 2020; 10(1): 14637. doi: 10.1038/s41598-020-71621-7
99. Jueng RN, Chen IJ. The effects of horticultural therapy on sense of coherence among residents of long-term care facilities: a quasi experimental design. *International Journal of Environmental Research and Public Health*. 2022; 19(9): 5412. doi: 10.3390/ijerph19095412
100. Ramzi NR, Ahmad CB, Hamzah H, et al. The Relationship of Urban Farming with Horticultural Therapy for Urbanites: A Systematic Review. *Built Environment Journal*. 2024; 21(1): 63-75. doi: 10.24191/bej.v21i1.401
101. Mayo AL, Cheung B, Li J, et al. Feasibility of a yoga intervention in an inpatient limb loss rehabilitation program. *Canadian Prosthetics & Orthotics Journal*. 2024; 7(1): 43896. doi: 10.33137/cpoj.v7i1.43896
102. Pan Y, Deng X, Zhuang Y, et al. Research trends around exercise rehabilitation among cancer patients: a bibliometrics and visualized knowledge graph analysis. *BioMed Research International*. 2022; 2022(1): 3755460. doi: 10.1155/2022/3755460
103. Patt N, Kool J, Hersche R, et al. High-intensity interval training and energy management education, compared with moderate continuous training and progressive muscle relaxation, for improving health-related quality of life in persons with multiple sclerosis: study protocol of a randomized controlled superiority trial with six months' follow-up. *BMC Neurology*. 2021; 21(1): 65. doi: 10.1186/s12883-021-02084-0
104. Hegberg NJ, Hayes JP, Hayes SM. Exercise intervention in PTSD: A narrative review and rationale for implementation. *Frontiers in Psychiatry*. 2019; 10: 133. doi: 10.3389/fpsy.2019.00133
105. El Agaty SM, Kirmani A, Labban E. Heart rate variability analysis during immediate recovery from exercise in overweight/obese healthy young adult females. *Annals of Noninvasive Electrocardiology*. 2017; 22(3): e12427. doi: 10.1111/anec.12427
106. Mustian KM, Alfano CM, Heckler C, et al. Comparison of pharmaceutical, psychological, and exercise treatments for cancer-related fatigue: a meta-analysis. *JAMA Oncology*. 2017; 3(7): 961-968. doi: 10.1001/jamaoncol.2016.6914
107. Sandri E, Capoferri M, Luciani G, et al. The Link Between Physical Activity, Nutrition, and Health: A Cross-Sectional Study with Multivariate Analysis in a Young and Predominantly Female Spanish Sample. *Nutrients*. 2025; 17(9): 1486. doi: 10.3390/nu17091486

108. Lin SH, Dionne TP. Interventions to improve movement and functional outcomes in adult stroke rehabilitation: Review and evidence summary. *Journal of Participatory Medicine*. 2018; 10(1): e8929. doi: 10.2196/jopm.8929
109. Zhu P, Liu X, Shang X, et al. Mindfulness-based stress reduction for quality of life, psychological distress, and cognitive emotion regulation strategies in patients with breast cancer under early chemotherapy—A randomized controlled trial. *Holistic Nursing Practice*. 2023; 37(3): 131-142. doi: 10.1097/HNP.0000000000000580
110. Bossi F, Zaninotto F, D’Arcangelo S, et al. Mindfulness-based online intervention increases well-being and decreases stress after Covid-19 lockdown. *Scientific Reports*. 2022; 12(1): 6483. doi: 10.1038/s41598-022-10361-2
111. Leyland A, Rowse G, Emerson LM. Experimental effects of mindfulness inductions on self-regulation: Systematic review and meta-analysis. *Emotion*. 2019; 19(1): 108. doi: 10.1037/emo0000425
112. Sajidah H, Khairunnisa S, Nabila C. The effect of relaxing a deep breath on anxiety levels. *KESANS: International Journal of Health and Science*. 2021; 1(2): 88-95. doi: 10.54543/kesans.v1i2.15
113. Antonioli L, Teixeira Macedo AB, Urrea Vega EA, et al. Cardiac Coherence and the Effectiveness of Cardiovascular Biofeedback in the Nursing Team: A Randomized Clinical Trial. *Aquichan*. 2024; 24(2). doi: 10.5294/aqui.2024.24.2.3
114. Dörenkamp S, Mesters EPE, Nijhuis-van der Sanden MWG, et al. How well do randomized controlled trials reflect standard care: A comparison between scientific research data and standard care data in patients with intermittent claudication undergoing supervised exercise therapy. *PLoS One*. 2016; 11(6): e0157921. doi: 10.1371/journal.pone.0157921
115. Ammar T. A randomized comparison of supervised clinical exercise versus a home exercise program in patients with chronic low back pain. *Physical Therapy and Rehabilitation*. 2017; 4(1): 7. doi: 10.7243/2055-2386-4-7
116. Mottershead R, Ghisoni M. Horticultural therapy, nutrition and post-traumatic stress disorder in post-military veterans: Developing non-pharmaceutical interventions to complement existing therapeutic approaches. *F1000Research*. 2021; 10: 885. doi: 10.12688/f1000research.70643.1
117. Tan CM, Chua AMJM, Low LL, et al. Exploring the determinants of age-friendly neighbourhoods among seniors residing in a Low-Income urban community in singapore: A participatory study. In: *Effects of Design on Health and Wellbeing*. IOS Press; 2024. pp. 518-537. doi: 10.3233/SHTI240969
118. KKim YH, Lee SH, Park CS, et al. A horticultural therapy program focusing on gardening activities to promote psychological, emotional and social health of the elderly living in a homeless living facility for a long time: A pilot study. *Journal of People, Plants, and Environment*. 2020; 23(5): 565-576.
119. Malashenkova VO, Dukhina VS. Rest and recreation areas in rehabilitation centers: Creating an environment for recovery. *Regional Problems of Architecture and Urban Planning*. 2023; 17: 333–342.
120. Shehzad F, Begum A, Muhammad B. The importance of exercise therapy in pulmonary rehabilitation of lungs cancer patients. *Global Sociological Review*. 2021; VI(I): 181–187. doi: 10.31703/gsr.2021(VI-I).21
121. Saito A, Masuyama M, Ishiyama D, et al. Rapid recovery in a patient with severe COVID-19 after a low-load, high-frequency rehabilitation program using an ergometer in the supine position. *Journal of Nippon Medical School*. 2023; 90(5): 414-418. doi: 10.1272/jnms.JNMS.2023_90-602
122. Schuber AA, Schmidt S, Hombach S, et al. The effects of exercise therapy feedback on subjective treatment outcome and patient satisfaction: study protocol for a mono-centric, randomized, controlled trial in orthopedic rehabilitation (FeedYou). *BMC Sports Science, Medicine and Rehabilitation*. 2023; 15(1): 17. doi: 10.1186/s13102-023-00626-2
123. Volkova SS, Kyi OG. Trainmyn soilshey lesh therapy coorsagh ayns duine lesh galley cree ischemic. *Scientific Journal of Mykhailo Drahomanov Ukrainian State University*. 2025; 1(186): 36–40.