



THE PSYCHOLOGICAL LANDSCAPE OF CANCER IMMUNOTHERAPY, NAVIGATING THE EMOTIONAL CHALLENGES OF NOVEL TREATMENTS

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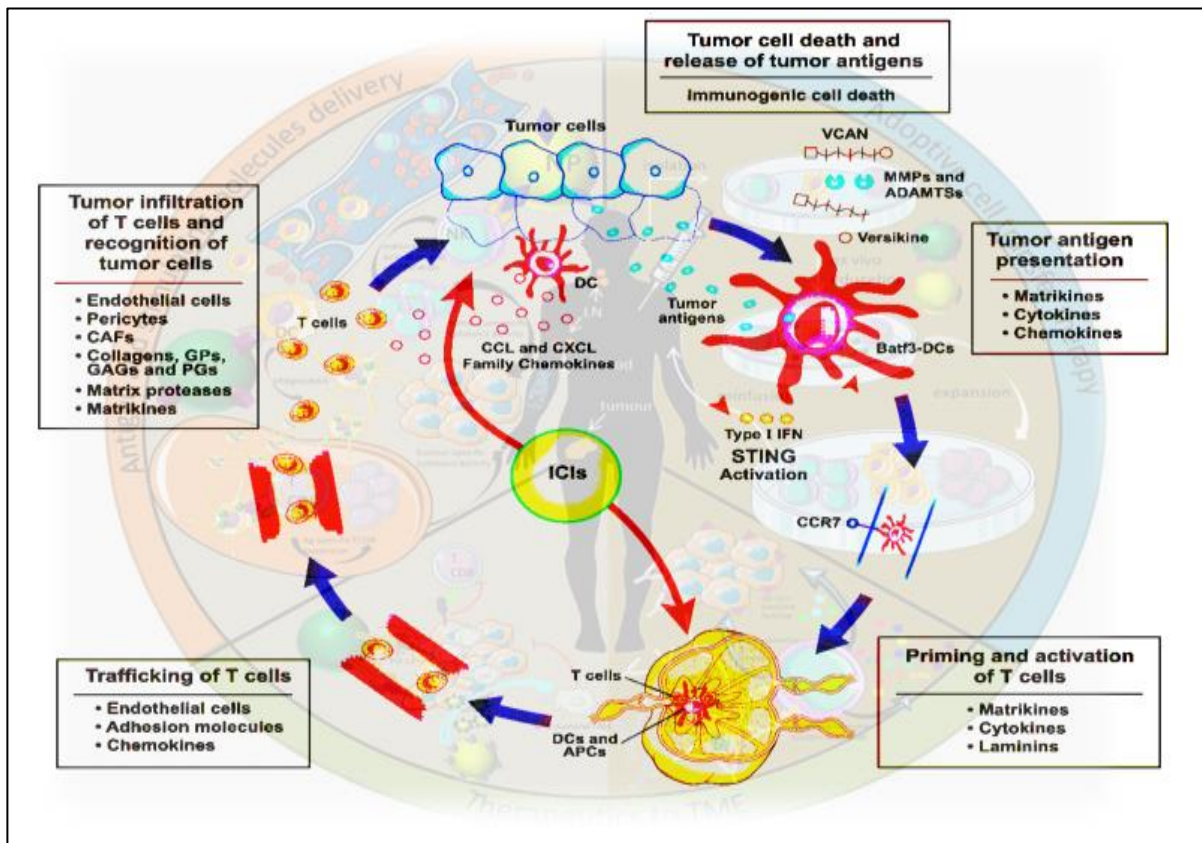
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Abstract

Cancer immunotherapy has transformed oncology and given patients new hope. It includes cutting-edge therapies like immune checkpoint inhibitors and CAR-T cell therapy. The quick development of these treatments, however, brings with them severe psychological difficulties. Due to the unique and unpredictable nature of immunotherapy, patients frequently experience increased levels of anxiety, uncertainty, and emotional discomfort.

Feelings of fear and loneliness may worsen as a result of the treatment's protracted and challenging course and possible adverse consequences. This review explores how patients' emotional responses to cancer immunotherapy affect their well-being and the course of their treatment, delving into the psychological terrain around this approach. It emphasizes mental health providers' vital role in offering assistance and promoting an integrated care strategy considering patient care's medical and psychological components. This study emphasizes the significance of holistic patient care, where emotional and psychological support is smoothly incorporated into the treatment process, by concentrating on the confluence between immunotherapy and mental health. Improving the general quality of life for cancer patients receiving immunotherapy and ensuring that advancements in treatment match advancements in patient care depend on understanding and attention to these psychological aspects.



Graphical Abstract

Keywords: Cancer immunotherapy, Emotional challenges, Psychological impact, Patient coping mechanisms, Novel cancer treatments, Mental health in cancer patients, Anxiety and depression, Patient support systems, Psychological resilience

Introduction

The inauguration of cancer treatments represents a paradigm change in the way this intricate group of illnesses is treated. Chemotherapy was the first step in the trip; a revolutionary but blunt tool, it was efficient in quickly destroying proliferating cancer cells but also caused significant harm to healthy tissues and had severe side effects (Nasir et al., 2021). The drawbacks of chemotherapy eventually prompted the creation of more focused strategies. The development of targeted medicines, which target specific molecular markers linked to cancer and lessen collateral harm to normal cells, marked a substantial advancement (Geng et al., 2017). On the other hand, these treatments encountered difficulties such as resistance building and low effectiveness in specific cancer types. The real game-changer in cancer treatment came with the emergence of immunotherapy, which harnesses the body's immune system to identify and attack cancer cells. This innovative approach has opened new avenues for treatment and offered hope for long-term remission and even potential cures for certain previously deemed incurable cancers (Tavakolpour et al., 2021). Immunotherapy, including checkpoint inhibitors, CAR-T cell therapy, and cancer vaccines, has transformed the therapeutic landscape, making it possible to personalize treatment to the patient's unique tumor profile. This new era in cancer treatment is characterized by a more precise, patient-centered approach, aiming to improve survival rates and quality of life while minimizing the toxic side effects traditionally associated with cancer therapy (Temel et al., 2022). Nevertheless, immunotherapy and targeted medicines may provide even more potent and minimally intrusive treatment alternatives, opening the door to the possibility of managing or perhaps curing cancer (Emens et al., 2017). The emerging complexity of oncology is reflected in the wide-ranging and profound psychological effects of technological advancements in cancer care. Patients face a variety of psychological repercussions that can both lessen and increase their mental health issues as medical technology

advances and offers more individualized and efficient treatment alternatives (Kazdin et al., 2011). Precision medicine, immunotherapy, and sophisticated imaging methods are examples of breakthroughs that, on the one hand, give patients hope and a sense of empowerment by customizing therapies to match their genetic profiles and cancer kinds. The anxiety and depression brought on by the unpredictability of conventional treatment plans are frequently reduced by this individualized approach, which also often produces better results and a more positive outlook (Maj et al., 2020). Moreover, technologies like telemedicine and digital health platforms have made it easier for patients to access care, support networks, and mental health resources, potentially reducing the feelings of isolation and helplessness that often accompany a cancer diagnosis. However, these technological breakthroughs also pose new psychological pressures. The intricacy of cutting-edge therapies can contribute to information overload, causing patients to feel overwhelmed by the sheer quantity of data and decisions they must manage (Salmon et al., 2021). Increased worry may come from this, especially for people who find it difficult to comprehend or trust new technology. Furthermore, the high price of cutting-edge therapies may make people feel more stressed financially, which can increase emotions of anxiety, shame, and uncertainty about the future. The rapid pace of technological change can also create a sense of disconnection for some patients, as they may feel that their care is more focused on machines and data than their personal experiences and emotional needs (Shareef et al., 2021). This apparent depersonalization of treatment can contribute to feelings of loneliness and alienation, compromising the therapeutic interaction between patients and healthcare practitioners. Furthermore, the psychological influence extends to the ethical challenges created by technologies such as genetic testing and artificial intelligence in decision-making, which can raise concerns about privacy, autonomy, and the possibility of discrimination. Patients may struggle with the implications of knowing their genetic risk for cancer or the possibility that AI-driven algorithms might influence their treatment choices (Rasool et al., 2024). While technological advances in cancer care have the potential to improve patient outcomes significantly, they also bring about a complex array of psychological challenges that must be carefully managed to ensure that patients receive the best possible physical care and the necessary emotional and psychological support (Naylor et al., 2016). Examining the intricate and varied psychological experiences that patients have while undergoing this cutting-edge cancer treatment is necessary to define the emotional terrain of immunotherapy (Jennings et al., 2021). Using the body's immune system to find and eliminate cancer cells, immunotherapy is a significant departure from conventional cancer treatment methods like radiation and chemotherapy. Immunotherapy has revolutionary therapeutic promise, but it also brings with it a whole new set of emotional difficulties. Patients may go through a wide range of emotions, from optimism and hope for a significant remission or cure to fear and doubt about the therapy's efficacy and possible negative consequences. The unpredictable nature of immunotherapy's outcomes, coupled with the often severe and diverse side effects, can contribute to heightened levels of stress and fear (Jongerius et al., 2022). However, the concept of an enhanced immune response leading to autoimmune reactions or the development of inflammatory conditions adds another layer of psychological complexity. Patients may also struggle with adjusting to the changes in their physical appearance and overall health, which can affect their self-esteem and quality of life. Additionally, the journey of immunotherapy often involves frequent and extended hospital visits, which can disrupt daily routines and social interactions, leading to feelings of isolation and distress (Park et al., 2020). Addressing these emotional components is critical because they substantially influence patients' quality of life, adherence to therapy, and general well-being. To help patients receiving immunotherapy traverse the complex emotional landscape of their treatment journey, healthcare practitioners must be aware of and responsive to their emotional requirements. This includes providing psychological counseling and other forms of endorsement (Boulanger et al., 2024). This evaluation aims to assess the effects of novel immunotherapeutic agents on mental health and develop targeted interventions that can optimize psychological support and enhance overall treatment outcomes.

2. Psychoneuroimmunology, The Mind-Body Connection in Cancer Treatment

Through intricate connections between the immunological, endocrine, and neurological systems, psychological emotions majorly impact immune function. Negative emotional states such as stress, anxiety, despair, and others can set off a series of physiological reactions that impede immune function (Kiecolt-Glaser et al., 2002). HPA axis is triggered when the body experiences stress, which causes the production of the stress hormone cortisol. While persistent increases brought on by ongoing psychological strain can depress the immune system by lowering the synthesis of cytokines critical for the body's inflammatory response and the activation of immune cells, cortisol is necessary for handling acute stress. The body becomes more vulnerable to infections as a result of this suppression, which also slows down the healing of wounds and may even play a role in the onset and spread of illnesses like cancer. On the other side, certain psychological emotions, such as contentment and a sense of well-being, have been demonstrated to enhance immune function (Barak et al., 2006). These conditions are linked to decreased cortisol levels and the generation of advantageous cytokines that boost the activity of natural killer cells, which are essential for identifying and eliminating cancerous or contaminated cells. Additionally, it has been shown that psychological therapies such as cognitive-behavioral therapy, mindfulness, and relaxation methods enhance immune function by lowering stress and fostering pleasant emotional states. Consequently, the relationship between immune system performance and psychological moods emphasizes how crucial mental health is to preserving general physical health and disease resistance (Dienstbier et al., 1989).

- Negative Psychological States → Activation of HPA Axis → Increased Cortisol → Suppressed Immune Function → Higher Disease Susceptibility
- Positive Psychological States → Reduced Activation of HPA Axis → Decreased Cortisol → Enhanced Immune Function → Lower Disease Susceptibility

2.1. The Role of Stress and Resilience in Cancer Outcomes

A patient's journey through diagnosis, treatment, and recovery can be significantly impacted by the intricate interaction of psychological, physiological, and social elements that contribute to stress and resilience in cancer outcomes. Prolonged stress has been associated with the advancement of cancer via several pathways, such as immune system suppression, angiogenesis stimulation, and the formation of an environment conducive to tumor growth (Dai et al., 2020). In addition, stress can worsen the adverse effects of cancer therapies, lower the quality of life for patients, and result in less consistent adherence to treatment plans. Resilience, on the other hand, is the ability to overcome hardship and bounce back from setbacks, which may be protective against cancer outcomes. Resilient people are better able to handle the psychological and emotional strain that comes with cancer, which frequently leads to better-coping mechanisms, more effective emotional control, and more robust social support systems (Seiler et al., 2019). The detrimental effects of stress can be lessened by resilience, which may improve treatment results, increase survival rates, and improve quality of life both during and after treatment. This dual effect emphasizes how crucial it is to incorporate interventions that foster resilience and psychological support into cancer care to provide patients with the tools they need to manage the emotional and psychological complexities that come with the illness, in addition to the physical difficulties it presents (Eicher et al., 2015).

2.2. Integrating Psychoneuroimmunology into Immunotherapy Practices

Improving cancer treatment results by incorporating psychoneuroimmunology (PNI) into immunotherapy methods is a promising area of research. In PNI, the significance of mental health in regulating immunological responses is emphasized by examining the complex interplay of the neurological system, the immune system, and the psychological condition (Ortega et al., 2022). Medical professionals may create more comprehensive immunotherapy strategies by recognizing that the immune system and the brain communicate in both directions. For example, it has been demonstrated that stress and depression impair immunological function, which may reduce the effectiveness of immunotherapeutic treatments. Treatment regimens incorporating cognitive-behavioral therapy, mindfulness, and stress reduction approaches might help patients feel better

psychologically and respond better physically (Apolinário-Hagen et al., 2020). This integration may result in more individualized treatment regimens that optimize therapeutic outcomes by combining immunotherapy with psychological evaluations and therapies. PNI concepts also open the door to creating biomarkers that forecast immunotherapy effectiveness based on psychological variables, enabling more focused and efficient medical interventions. By addressing the psychological aspects of treatment, incorporating PNI into immunotherapy practices can revolutionize cancer care and enhance patient quality of life and clinical outcomes.

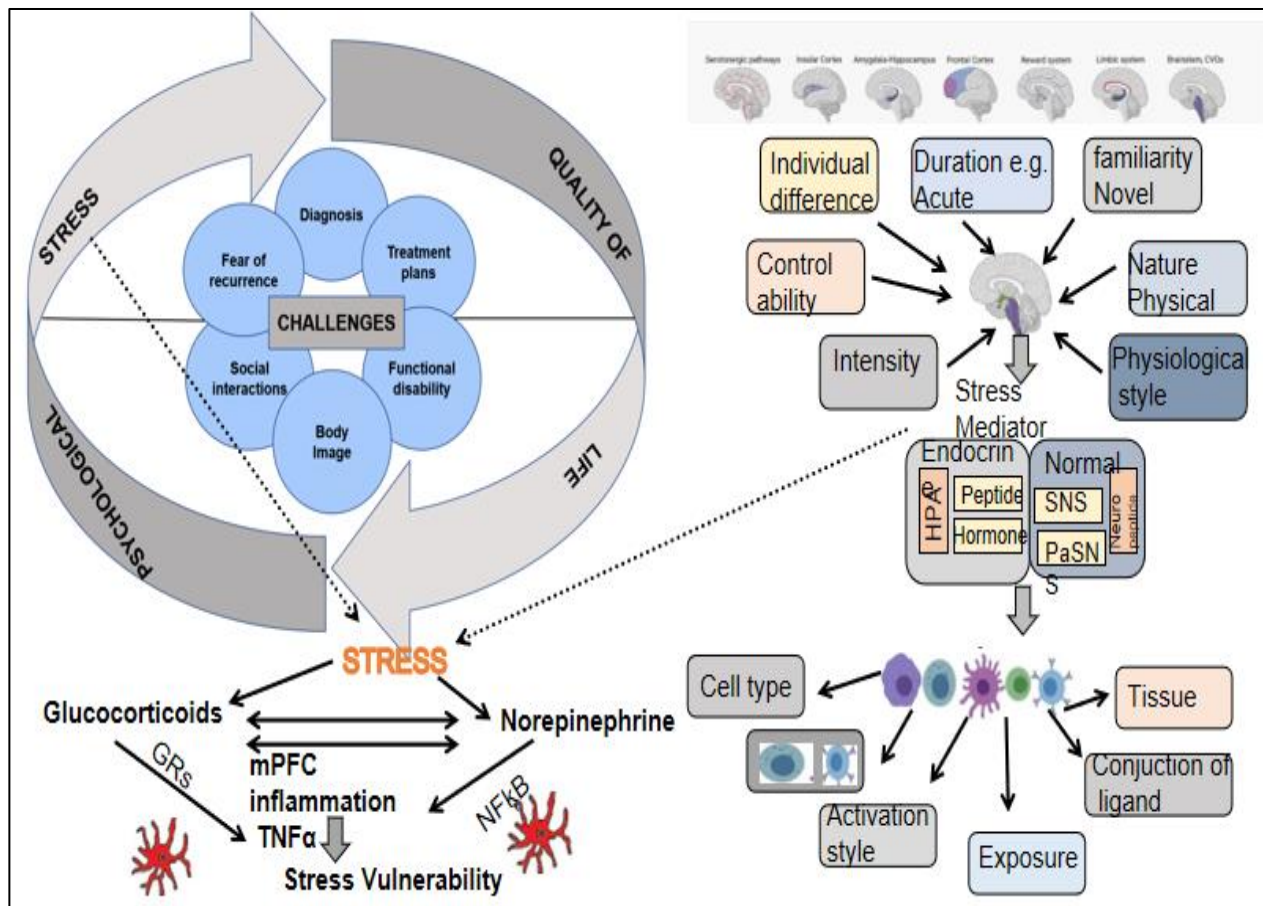


Fig 1: Psychoneuroimmunology, The Mind-Body Connection in Cancer Treatment

3. Emotional Turbulence

3.1. The Psychological Impact of Immunotherapy

Improving cancer treatment results by incorporating PNI into immunotherapy methods is a promising area of research. In PNI, the significance of mental health in regulating immunological responses is emphasized by examining the complex interplay of the neurological system, the immune system, and the psychological condition (Ortega et al., 2022). Medical professionals may create more comprehensive immunotherapy strategies by recognizing that the immune system and the brain communicate in both directions. For instance, it has been demonstrated that stress and depression impair immunological function, which may reduce the effectiveness of immunotherapeutic treatments. Treatment regimens incorporating cognitive-behavioral therapy, mindfulness, and stress reduction approaches might help patients feel better psychologically and respond better physically (Apolinário-Hagen et al., 2020). This amalgamation may result in more individualized treatment regimens that optimize therapeutic outcomes by combining immunotherapy with psychological evaluations and therapies. PNI concepts also open the door to creating biomarkers that forecast immunotherapy effectiveness based on psychological variables, enabling more focused and efficient medical interventions. Ultimately, by addressing the psychological aspects of treatment,

incorporating PNI into immunotherapy practices can revolutionize cancer care and enhance patient quality of life and clinical outcomes (Standish et al., 2023).

Key Element	Description	Mechanism of Action	Potential Impact on Immunotherapy	Clinical Implications
Stress and Immune Function	Chronic stress negatively affects immune responses, leading to reduced effectiveness of immunotherapies.	Stress hormones like cortisol suppress immune cell activity and reduce cytokine production.	Decreased response to immunotherapy, the potential for faster disease progression.	Stress management strategies should be integrated into treatment to support immune function.
Mind-Body Interventions	Techniques such as mindfulness, meditation, and yoga can modulate immune function and reduce inflammation.	These interventions reduce stress and anxiety, lowering cortisol levels and enhancing immune responses.	Potential enhancement of immunotherapy outcomes through improved immune system function.	Incorporation of mind-body therapies into treatment plans could improve both psychological and physical outcomes.
Psychosocial Biomarkers	Identification of psychosocial biomarkers that predict response to immunotherapy based on mental health.	Psychological states influence biomarkers like cytokines, which can predict treatment outcomes.	Personalized immunotherapy plans based on psychosocial profiles lead to more targeted and effective care.	Development of screening tools for psychosocial biomarkers to tailor treatment strategies.
Depression and Immune Suppression	Depression is linked to immune suppression, which may diminish the efficacy of cancer treatments.	Altered neurotransmitter levels affect the HPA axis, leading to immune dysregulation.	Lowered effectiveness of immunotherapy, increased risk of treatment resistance.	Psychological support and depression screening should be standard in cancer care protocols.
Family and Social Support	Strong social support networks have improved immune function and treatment outcomes.	Social support reduces stress and improves emotional well-being, positively influencing immune responses.	Enhanced effectiveness of immunotherapy, better patient adherence, and reduced treatment-related complications.	Encouraging patient engagement with support groups and family involvement in care planning.
Education and Training for Healthcare Providers	Training healthcare providers in PNI and its relevance to cancer treatment can improve patient outcomes.	Knowledge of PNI allows providers to recognize the importance of psychological factors in immune function.	Knowledge of PNI allows providers to recognize the importance of psychological factors in immune function.	Continuous education programs should be established to keep healthcare providers updated on PNI research.
Neurotransmitters and Immune Regulation	Neurotransmitters like serotonin and dopamine play a role in immune regulation, affecting treatment outcomes.	Neurotransmitter levels influence cytokine production and immune cell activity, impacting therapy response.	Understanding neurotransmitter-immune interactions could lead to targeted therapies that enhance immunotherapy.	Research into neurotransmitter-immune interactions should be prioritized to develop new adjunctive therapies.

Table 1: Integrating Psychoneuroimmunology PNI into Immunotherapy Practices: Key Elements, Mechanisms, and Implications

3.2. Immunotherapy-Induced Anxiety, Understanding Triggers and Responses

Although immunotherapy is a unique and frequently aggressive kind of cancer treatment, anxiety related to it is becoming a more recognized psychological problem. Patients may encounter severe

and erratic side effects, such as immune-related adverse events and cytokine release syndrome since immunotherapy targets the body's immune system to target cancer cells (Rahman et al., 2022). Patients may have increased worry due to these possible effects since they are concerned about how their therapy will turn out. Furthermore, the aggressive approach and novelty of immunotherapy might exacerbate patients' concerns of the unknown, adding to their mental distress. Anxiety can be made worse by the worry of illness progression, the stress of frequent monitoring, and the expectation of therapeutic adverse effects. Besides, patients may experience psychological distress as a result of dealing with severe and ongoing physical symptoms and side effects. Additionally, individual characteristics, including personality traits, coping strategies, and pre-existing mental health disorders, might affect the emotional and cognitive reactions to immunotherapy (Dunn Galvin et al., 2018). Healthcare professionals must comprehend these triggers and responses to create specialized therapies that meet the psychological requirements of immunotherapy patients. Healthcare providers may assist patients in managing their anxiety, enhancing their general quality of life, and perhaps improving treatment adherence and outcomes by including psychological support in the treatment plan (van Dulmen et al., 2007).

3.3. Psychological Toll of Managing Chronic Side Effects

Taking care of long-term side effects from cancer therapy takes a heavy psychological toll on patients since these symptoms are sometimes so persistent that they negatively affect mental health in addition to physical discomfort. An ongoing cycle of discomfort and dissatisfaction can result from chronic side effects such as persistent pain, exhaustion, cognitive impairment, and emotional issues (Turk et al., 2016). Because they are always unsure of their health state and the efficacy of their therapy, patients may feel anxious and powerless. Depression and a worse quality of life can be fostered by the ongoing need for medical treatments and changes to address these side effects, which can make one feel like they have no control over their life. The psychological and social effects are as profound since sufferers may distance themselves from social interactions and connections, which exacerbates feelings of loneliness. Although coping mechanisms frequently combine social support networks, psychological counseling, and medical assistance, managing long-term side effects is still a difficult task that calls for a comprehensive strategy that takes into account both the mental and physical aspects of healing (Stein et al., 2008).

4. Patient Narratives: Lived Experiences of Immunotherapy

4.1. Case Studies of Psychological Adaptation

Psychological adaptation case studies provide insightful information on how people cope with major life changes and obstacles, showcasing the variety of coping mechanisms people employ to manage stress and trauma. For example, a well-known case study may examine the psychological adaptations made by individuals with long-term illnesses like cancer, including their emotional reactions, coping mechanisms, and changes in how they view themselves (Rohan et al., 2020). A case study may center on a cancer survivor who went through severe anxiety and despair at first but eventually developed resilience with the help of support groups, cognitive-behavioral therapy, and self-help techniques like mindfulness. Another example may look at how people adjust psychologically to significant life transitions like retiring or moving by redefining who they are and creating new routines that provide them stability and a feeling of purpose. These investigations, which offer qualitative and quantitative information on the efficacy of different coping mechanisms, frequently emphasize the contribution of social support, treatments, and personal strengths to psychological adaptation. These case studies add to a better understanding of psychological resilience and influence the creation of more effective therapies suited to a range of needs by capturing the distinctive experiences of people navigating major life upheavals (Panter-Brick et al., 2011).

4.2. The Role of Patient Stories in Shaping Emotional Resilience

Patient tales are essential in fostering emotional resilience since they offer a story others can connect to and learn from. These narratives provide patients with a potent means of processing their

encounters, expressing their difficulties, and finding comfort in the experiences of others. Patients can encourage others going through similar struggles by candidly discussing their experiences, which helps build empathy and a sense of connection essential for emotional resilience (Focht-Birkerts et al., 2000). Personal tales draw attention to how individuals deal with sickness, highlighting coping mechanisms and inner resources that may otherwise go overlooked. Additionally, they lessen feelings of powerlessness and loneliness by normalizing the emotional reactions to sickness. Furthermore, by emphasizing the human side of healthcare that clinical reports and statistics sometimes ignore, patient tales can spur systemic change by promoting more patient-centered and compassionate methods in medical practice. Patient narratives foster community building and individual healing by promoting an exchange of experiences that celebrates and fosters endurance (Sharf et al., 2003).

4.3. Lessons Learned from Survivorship Narratives

Remarkably, in the context of sickness or trauma, survivorship tales provide a deep insight into the complex path of people who have faced and overcome life-altering situations. These stories effectively comprehend survivability's social, psychological, and emotional aspects (Mar et al., 2008). These tales teach us that overcoming adversity involves more than just physical healing; it also entails navigating the complexity of identity, resiliency, and life after trauma. Survivorship stories frequently highlight the value of support and community networks, emphasizing how connections may be a source of strength and mirror the difficulties encountered throughout the healing process. Researchers draw attention to the necessity of a holistic strategy for recovery, in which physical and mental health are treated equally. These tales also highlight how survival is erratic, with no clear path to success and the possibility of misfortunes equaling or exceeding achievements. They also provide light on the social and cultural elements that influence the experience of survivors, such as stigma, availability of resources, and the function of advocacy in converting individual hardship into group empowerment. In the end, survival stories provide important lessons about empathy, tenacity, and the lasting strength of the human spirit. They also educate us about the human potential for optimism and adaptation (Loftus et al., 2020).

5. Cultural and Societal Influences on Psychological Responses

5.1. The Role of Cultural Beliefs in Coping Mechanisms

Their cultural beliefs significantly influence the way people manage stress, trauma, and mental health issues. These widely held views affect psychological reactions by giving people a framework for understanding their experiences and creating coping mechanisms. They are integral to society (Folkman et al., 1984). In representative cases, people may primarily rely on social support networks like friends, family, and the community to handle psychological discomfort in collectivist societies, focusing on community and interdependence. This dependence on group coping strategies can foster a strong sense of security and belonging, enhancing resilience in the face of hardship. Furthermore, societal norms frequently define appropriate emotional expression, impacting how individuals interpret and express psychological suffering.

People may repress their emotions in societies that promote stoicism and emotional restraint, for instance, which might result in internalized stress and long-term psychological effects. On the other hand, societies that value candid communication about feelings may also promote early intervention and a proactive attitude to mental health management. Cultural beliefs are significant in determining coping techniques, impacting people's tactics and psychological health (Abdullah et al., 2011).

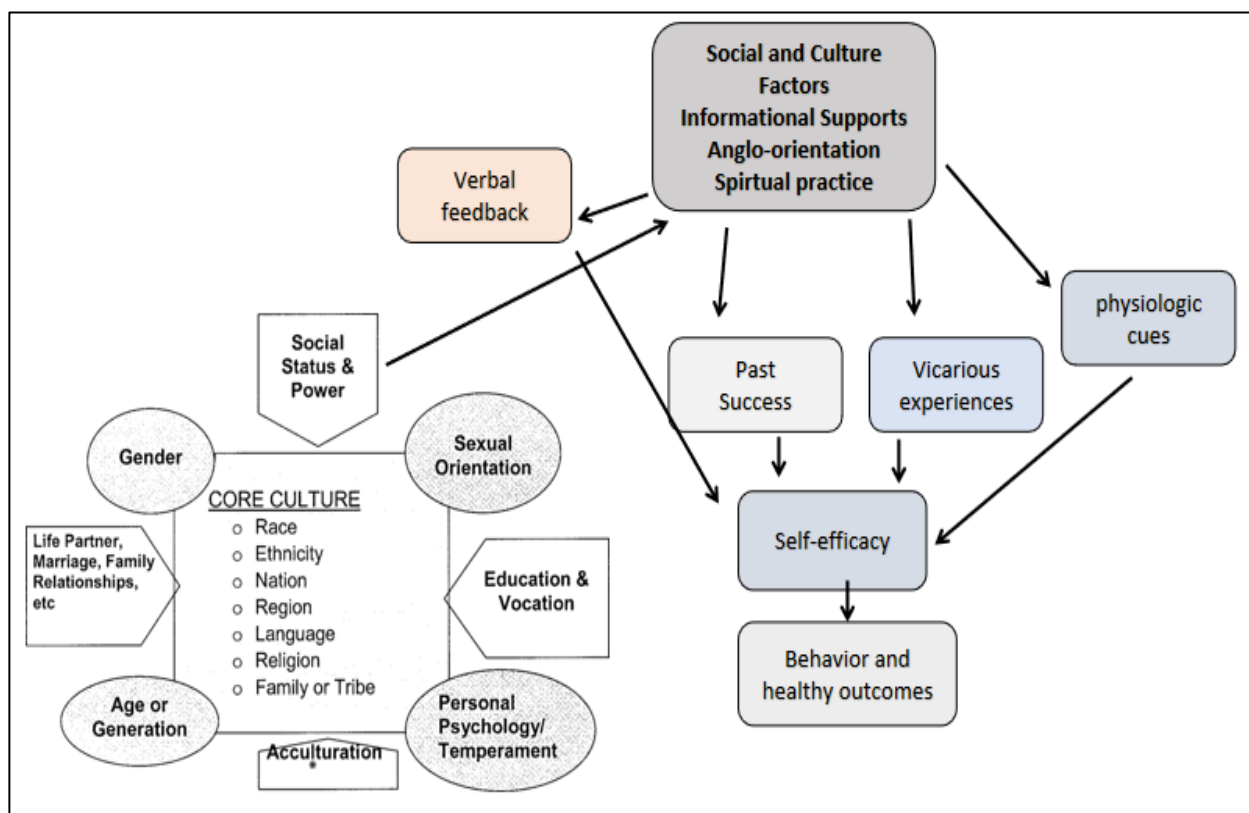


Fig 2: Cultural and Societal Influences on Psychological Responses

5.2. Societal Expectations and the Stigma of Cancer Treatment

Patients face many difficulties as a result of societal expectations and the stigma attached to cancer treatment, which frequently exacerbates the psychological effects of the illness. The enduring notion that cancer is a death sentence is prevalent in many cultures, which can cause social exclusion and a lack of hope for people who are afflicted (Little et al., 2004). Social expectations that people should always be strong and optimistic, regardless of their mental or physical health, further exacerbate this stigma and can leave patients feeling amateurish or condemnable if they are unable to live up to these unattainable ideals. Because society values physical attractiveness and vitality, observable side effects of cancer therapies, such as weariness, weight changes, and hair loss, can also result in public scrutiny and condemnation. Meanwhile, the financial strain of cancer treatment and the assumption that people should carry on with their jobs and social and familial responsibilities can exacerbate anxiety and stress. In addition to hurting cancer patient's mental health, this pressure and shame from society might make them less likely to seek help or follow treatment plans. Therefore, resolving these problems is essential to enhancing cancer patients' general well-being and fostering a more understanding and encouraging atmosphere that acknowledges the complicated reality of both coping with and diagnosing cancer (Geffen et al., 2004).

5.3. Addressing Disparities in Psychological Care Across Demographics

Ensuring that everyone, regardless of background, has fair access to mental health treatments is a complex task that calls for a comprehensive approach to address gaps in psychological care across populations. These differences frequently result from a complicated interaction of variables, such as socioeconomic level, racial or ethnic background, gender, place of residence, and cultural views (Williams et al., 2010). People from underprivileged origins or disadvantaged areas, for example, could encounter obstacles, including a dearth of reasonably priced healthcare, a shortage of culturally competent healthcare professionals, and institutionalized prejudices in the healthcare system. These challenges might result in incorrect or underdiagnosed psychological problems as well as insufficient treatment, which feeds the cycle of inequity. Policies that support diversity in the mental health workforce, improve cultural competence training, and expand access to treatments in marginalized

communities must be put into place to reduce these inequities. In addition, addressing the socioeconomic determinants of health, housing, work, and education can be conducive to lessening the psychological toll on underprivileged groups. Telehealth services and community-based initiatives are viable ways to bridge the access gap to treatment, particularly in rural or isolated places. To create a more responsive and inclusive mental health system, it is ultimately necessary to make a concentrated effort to identify and eliminate the structural injustices that contribute to these gaps to achieve equality in psychological therapy (Tribe et al., 2018).

6. Technological Interventions in Psychological Support

6.1. Digital Therapeutics: Apps and Tools for Emotional Well-being

The emergence of digital treatments has brought about a tremendous transformation in the field of psychological support by providing new tools and applications that promote emotional well-being. These digital technologies aim to offer easily accessible, individually tailored mental health treatment. These technologies have become essential to contemporary psychological therapies, ranging from mindfulness platforms and AI-powered mental health chatbots to applications for cognitive behavioral therapy and mood tracking (Olawade et al., 2024). They let people participate in therapeutic activities at their speed, provide real-time feedback, and enable continuous monitoring of emotional states. Additionally, these applications' incorporation of machine learning and data analytics enables the customization of treatments, increasing their efficacy. These digital treatments bridge the gap between traditional therapy and the need for instant, on-demand assistance while also improving mental health support's accessibility. Through technology, these tools enable people to actively manage their emotional well-being, build resilience, and advance mental health in a society where psychological issues are becoming increasingly common (Gaggioli et al., 2017).

App/Tool	Description	Primary Focus	Key Features	Evidence of Effectiveness	References
Calm	A meditation app focused on mental health and sleep.	Stress, Anxiety, Sleep	Sleep stories, meditation sessions, calming music	Recognized by the American Psychological Association for its impact	Huberty et al., 2019
Talkspace	An online therapy platform connecting users with therapists	Online Therapy and Counseling	Text, video, and audio messaging with licensed therapists	High user satisfaction rates and clinical improvements	Darnell et al., 2022
Headspace	A mindfulness and meditation app designed to reduce stress	Mindfulness and Stress Reduction	Guided meditations, sleep sounds, breathing exercises	Clinical trials showing the reduction in stress and anxiety levels	Mani et al., 2015
Woebot	An AI-driven chatbot offering CBT-based support	Cognitive Behavioral Therapy (CBT)	AI-driven conversations, mood tracking, psychoeducation	Studies demonstrating improvement in mood and reduced depression	Jiang et al., 2024
Youper	An AI-based emotional health assistant	Emotional Self-care and Support	AI-driven conversations, mood tracking, CBT techniques	Research indicates effectiveness in improving emotional well-being.	Alotaibi et al., 2023
BetterHelp	A platform for online counseling and therapy	Therapy and Emotional Support	Access to licensed therapists, customizable communication options	Positive outcomes in therapeutic interventions	Dwyer et al., 2021
Sanvello	An app offering CBT, mindfulness, and habit-tracking	Stress, Anxiety, Depression	Self-assessment, daily mood tracking, personalized progress insights	Proven to reduce symptoms of anxiety and depression	Hamre-Os et al., 2021

Table 2: Overview of Key Digital Therapeutic Tools for Emotional Well-being

6.2. Virtual Reality (VR) for Anxiety and Pain Management

In the fields of anxiety and pain management, VR has become a game-changer by providing immersive experiences that can effectively change patients' perceptions and reactions to stressors and discomfort. In anxiety management, VR is used to create controlled, simulated environments where people can face and gradually desensitize anxiety-provoking stimuli in a safe and structured way (Gorini et al., 2008). This type of exposure therapy is as beneficial for treating phobias, social anxiety, and PTSD since it offers patients a safe and controlled way to interact with their fears. In addition, VR is increasingly being recognized for its ability to distract from pain and lessen pain perception. VR can help patients with both acute and chronic pain disorders by disabling the brain's pain signals and immersing them in relaxing and stimulating virtual settings. Because of the adaptability of VR technology, treatment regimens may be customized to meet the unique requirements of each patient, increasing the effectiveness of treatments. VR technology is finding more and more uses in the medical field as it develops, providing promising new paths for non-pharmacological treatments that address patient care's psychological and physical aspects (Alemanno et al., 2019).

7. Ethical Considerations in Psychological Support for Immunotherapy Patients

7.1. Balancing Hope and Realism: Ethical Dilemmas in Communication

Balancing optimism and realism in communication may be challenging, especially regarding medical treatment and psychological assistance. On the one hand, because hope profoundly affects general well-being and recovery results, it is essential for patient motivation and adherence to treatment regimens. Hope gives people a feeling of control and optimism, frequently enhancing their quality of life and psychological toughness (Martínez-Martí et al., 2017).

On the other hand, unrealistic expectations can cause disappointment if an overly optimistic or misguided hope is not based on reality. It becomes imperative for professionals to speak openly and clearly, refraining from making unrealistic promises regarding results and enticing patients to have hope for their future. Professionals must carefully control their communications to be upbeat and accurate, ensuring they do not inadvertently contribute to false hopes or foster a sense of despair. This is an ethical challenge. A sophisticated strategy that includes open communication, honest information sharing, and ongoing patient and family engagement is necessary to achieve this balance. The ultimate objective is to help patients in a way that preserves their optimism and their faith in the healthcare system while also respecting their autonomy, adhering to their beliefs, and preparing them for every eventuality (Levy et al., 2017).

7.2. Navigating Patient Autonomy and Psychological Vulnerability

Consent and psychological readiness are essential parts of the clinical trial procedure, particularly for experimental therapies in cancer. The process of obtaining informed consent is complex and calls for thorough and transparent information on the nature of the experimental treatment, including any possible risks, advantages, and uncertainties. Patients' complete comprehension of the treatment's experimental nature and its potential consequences must be guaranteed by this procedure (Weeks et al., 2012). Assessing and treating patients' emotional and cognitive preparation for the therapy, their capacity to handle any side effects, and the inherent uncertainty of innovative medicines are all part of psychological preparedness.

Because the results of experimental treatments are unpredictable and there is a chance of serious adverse effects, they frequently cause psychological distress. Respecting patients' rights to make educated decisions while considering their psychological vulnerabilities is crucial to navigating patient autonomy. In order to acknowledge the influence of experimental therapy on a patient's mental health and general well-being, permission must strike a balance that is both legally and morally sound. Consequently, a thorough approach to psychological readiness and informed consent can promote patient autonomy, increase adherence to treatment plans, and help conduct more reliable and morally sound clinical studies (Herlitz et al., 2016).

8. Innovative Approaches to Psychological Support

8.1. Integrative Therapies: Combining Traditional and Alternative Approaches

Complementary treatments, which blend conventional and alternative ways to give holistic care, are becoming increasingly popular in innovative approaches to psychological assistance. Integrative therapies combine complementary therapies like mindfulness, acupuncture, and nutritional counseling with the best elements of traditional medicine and cognitive-behavioral therapy. By meeting each person's specific needs, this mix seeks to address the complex aspect of mental health. Since they provide nonverbal avenues for emotional expression and processing, art and music therapy have become increasingly influential in healing emotional wounds (Yazdanpanah et al., 2022). People may explore and express emotions via artistic expression, which may be challenging to do with words alone, which promotes healing and self-discovery. Additionally, new support models are becoming more popular, and community programs and peer networks are essential for building resilience and a sense of belonging. These programs improve emotional well-being through mutual understanding and a sense of belonging by utilizing shared experiences and group support. By incorporating these inventive methodologies, psychological support systems may provide more comprehensive and efficient treatment, tackling the intricacies of mental health from several perspectives (Kazdin et al., 2013).

8.2. The Future of Psycho-Oncology in the Immunotherapy Era

Psycho-oncology is set to undergo a considerable change in response to the distinct psychological demands of patients navigating this new therapeutic environment as immunotherapy transforms the treatment of cancer. Increasingly advanced predictive models for psychological risk factors use large datasets to identify people who are more likely to experience psychological distress and adjust therapies appropriately (Dwyer et al., 2018). By combining patient demographics, illness features, and treatment details, these models predict psychological outcomes and allow for proactive management of mental health issues. Personalized psychological therapies have been further enhanced by AI and machine learning, enabling real-time modification of therapy tactics in response to unique patient reactions. AI algorithms may provide tailored recommendations for cognitive-behavioral treatments, stress management strategies, and emotional support mechanisms by examining trends in vast amounts of data. This approach guarantees more efficient and focused psychological care. Subsequent investigations will probably concentrate on incorporating these technology developments into clinical settings and examining their effects on treatment compliance, patient outcomes overall, and quality of life. Clinical innovations can take the shape of sophisticated digital platforms that maximize patient treatment by combining data scientists, psychologists, and oncologists with predictive analytics and interactive technologies to promote mental health. This interdisciplinary approach aims to promote psychological well-being and treatment effectiveness by addressing the complicated emotional environment that immunotherapy patients face (Dunn Galvin et al., 2018).

Area	Description	Current Status	Future Directions
AI and Machine Learning in Personalized Psychological Interventions	Utilization of AI and machine learning to customize psychological interventions for individual patients, optimizing therapeutic approaches.	Patient data is being analyzed to suggest personalized interventions, such as cognitive-behavioral therapies and stress management techniques.	Development of real-time adaptive systems that adjust interventions based on ongoing patient feedback and treatment progress. Integration with electronic health records for seamless personalization.
Clinical Innovations	Novel clinical practices that incorporate advanced technologies and collaborative approaches to enhance psychological care for cancer patients	Development of digital mental health platforms and multidisciplinary care models involving oncologists, psychologists, and data scientists.	Implementing comprehensive care models that leverage technological mental health support tools fosters collaboration between healthcare professionals to improve patient care and outcomes.

Predictive Models for Psychological Risk Factors	Models that predict psychological risks based on patient data, including demographics, disease details, and treatment specifics.	Current models use historical data and clinical information to predict psychological outcomes. Advanced models are being developed to include real-time data and broader patient variables.	Enhanced models incorporating real-time patient data, continuous learning algorithms, and integration with clinical workflows to provide dynamic risk assessments.
Future Research Directions	Investigating new methodologies and technologies in psycho-oncology, focusing on improving psychological support for patients undergoing immunotherapy.	Research includes studying the effects of immunotherapy on psychological well-being and evaluating the efficacy of new psychological interventions.	There has been an increased focus on integrating technological advancements, such as AI and predictive analytics, into clinical practice. Studies have been conducted on the impact of these innovations on patient quality of life and treatment outcomes.

Table 2: The Future of Psycho-Oncology in the Immunotherapy Era

Summary

Research on psychological support in cancer immunotherapy indicates a complex environment in which patient well-being and treatment effectiveness are greatly influenced by mental health. The summary of essential findings emphasizes that although immunotherapy presents revolutionary new opportunities for cancer treatment, the psychological side effects can have a significant negative influence on patient outcomes. Research indicates that integrated psychological support can improve coping strategies, lessen the stress associated with therapy, and raise the general quality of life. As such, psychological treatment must be woven into the very fabric of therapeutic practice. Creating comprehensive care models that include psychological evaluations and treatments into standard cancer treatment regimens is one of the recommendations for clinical application. In the future, the goal of integrating psychological care with immunotherapy is to develop a comprehensive strategy that smoothly combines clinical treatment regimens with psychological assistance. This integration ought to promote a patient-centered care paradigm that offers strong mental health support in addition to physical cancer therapy. By prioritizing these initiatives, the field may progress toward a more thorough and compassionate approach to cancer care, eventually enhancing patient outcomes and providing a more well-rounded treatment experience.

References

1. Abdullah, T., & Brown, T. L. (2011). Mental illness stigma and ethnocultural beliefs, values, and norms: An integrative review. *Clinical Psychology Review, 31*(6), 934-948.
2. Alemanno, F., Houdayer, E., Emedoli, D., Locatelli, M., Mortini, P., Mandelli, C., ... & Iannaccone, S. (2019). Efficacy of virtual reality to reduce chronic low back pain: Proof-of-concept of a non-pharmacological approach on pain, quality of life, neuropsychological and functional outcome. *PloS one, 14*(5), e0216858.
3. Alotaibi, A., & Sas, C. (2023, August). Review of AI-Based Mental Health Apps. In *36th International BCS Human-Computer Interaction Conference* (pp. 238-250). BCS Learning & Development.
4. Apolinário-Hagen, J., Drüge, M., & Fritsche, L. (2020). Cognitive behavioral therapy, mindfulness-based cognitive therapy and acceptance commitment therapy for anxiety disorders: integrating traditional with digital treatment approaches. *Anxiety disorders: Rethinking and understanding recent discoveries, 291-329*.
5. Apolinário-Hagen, J., Drüge, M., & Fritsche, L. (2020). Cognitive behavioral therapy, mindfulness-based cognitive therapy and acceptance commitment therapy for anxiety disorders: integrating traditional with digital treatment approaches. *Anxiety disorders: Rethinking and understanding recent discoveries, 291-329*.
6. Barak, Y. (2006). The immune system and happiness. *Autoimmunity reviews, 5*(8), 523–527.
7. Boulanger, M. C., Falade, A. S., Hsu, K., Sommer, R. K., Zhou, A., Sarathy, R., ... & Petrillo, L. A. (2024). Patient and Caregiver Experience With the Hope and Prognostic Uncertainty of Immunotherapy: A Qualitative Study. *JCO Oncology Practice, OP-24*.

8. Dai, S., Mo, Y., Wang, Y., Xiang, B., Liao, Q., Zhou, M., ... & Zeng, Z. (2020). Chronic stress promotes cancer development—frontiers in oncology, 10, 1492.
9. Darnell, D., Pullmann, M. D., Hull, T. D., Chen, S., & Areán, P. (2022). Predictors of disengagement and symptom improvement among adults with depression enrolled in talkspace, a technology-mediated psychotherapy platform: naturalistic observational study. *JMIR Formative Research*, 6(6), e36521.
10. Dienstbier, R. A. (1989). Arousal and physiological toughness: implications for mental and physical health. *Psychological review*, 96(1), 84.
11. Dunn Galvin, A., & Hourihane, J. O. B. (2018). Psychosocial mediators of change and patient selection factors in oral immunotherapy trials. *Clinical reviews in allergy & immunology*, 55(2), 217–236.
12. Dunn Galvin, A., & Hourihane, J. O. B. (2018). Psychosocial mediators of change and patient selection factors in oral immunotherapy trials. *Clinical reviews in allergy & immunology*, 55(2), 217–236.
13. Dwyer, A., de Almeida Neto, A., Estival, D., Li, W., Lam-Cassettari, C., & Antoniou, M. (2021). Suitability of text-based communications for the delivery of psychological therapeutic services to rural and remote communities: scoping review. *JMIR mental health*, 8(2), e19478.
14. Dwyer, D. B., Falkai, P., & Koutsouleris, N. (2018). Machine learning approaches for clinical psychology and psychiatry. *Annual review of clinical psychology*, 14(1), 91–118.
15. Eicher, M., Matzka, M., Dubey, C., & White, K. (2015, January). Resilience in adult cancer care: an integrative literature review. In *Oncology Nursing Forum* (Vol. 42, No. 1).
16. Emens, L. A., Ascierto, P. A., Darcy, P. K., Demaria, S., Eggermont, A. M., Redmond, W. L., ... & Marincola, F. M. (2017). Cancer immunotherapy: Opportunities and challenges in the rapidly evolving clinical landscape. *European journal of cancer*, 81, 116-129.
17. Focht-Birkerts, L., & Beardslee, W. R. (2000). A child's experience of parental depression: Encouraging relational resilience in families with affective illness. *Family Process*, 39(4), 417–434.
18. Folkman, S. (1984). Personal control and stress and coping processes: a theoretical analysis. *Journal of personality and social psychology*, 46(4), 839.
19. Gaggioli, A., Riva, G., Peters, D., & Calvo, R. A. (2017). Positive technology, computing, and design: shaping a future in which technology promotes psychological well-being. In *Emotions and affect in human factors and human-computer interaction* (pp. 477-502). Academic press.
20. Geffen, J. R. (2004). Creating optimal healing environments for patients with cancer and their families: insights, challenges, and lessons learned from a decade of experience. *Journal of Alternative & Complementary Medicine*, 10(Supplement 1), S-93.
21. Geng, F., Wang, Z., Yin, H., Yu, J., & Cao, B. (2017). Molecular targeted drugs and treatment of colorectal cancer: recent progress and future perspectives. *Cancer biotherapy & radiopharmaceuticals*, 32(5), 149-160.
22. Gorini, A., & Riva, G. (2008). Virtual reality in anxiety disorders: the past and the future. *Expert Review of Neurotherapeutics*, 8(2), 215-233.
23. Hamre-Os, A. (2021). *A mood tracking interface for the mobile application to help assess well-being in students* (Master's thesis, The University of Bergen).
24. Herlitz, A., Munthe, C., Törner, M., & Forsander, G. (2016). The counseling, self-care, adherence approach to person-centered care and shared decision making: moral psychology, executive autonomy, and ethics in multi-dimensional care decisions. *Health communication*, 31(8), 964-973.
25. Huberty, J., Vranceanu, A. M., Carney, C., Breus, M., Gordon, M., & Puzia, M. E. (2019). Characteristics and usage patterns among 12,151 paid subscribers of the calm meditation app: cross-sectional survey. *JMIR mHealth and uHealth*, 7(11), e15648.
26. Jennings, S., Anstey, S., Bower, J., Brewster, A., Buckman, J., Fenlon, D., ... & Watts, T. (2021). Experiences of cancer immunotherapy with immune checkpoint inhibitors (ExCI) insights of

- people affected by cancer and healthcare professionals: a qualitative study protocol. *BMJ open*, 11(5), e043750.
27. Jiang, M., Zhao, Q., Li, J., Wang, F., He, T., Cheng, X., ... & Fu, G. (2024). A Generic Review of Integrating Artificial Intelligence in Cognitive Behavioral Therapy. *arXiv preprint arXiv:2407.19422*.
 28. Jongerius, C., Vermeulen, L., van Egmond, M., Evers, A. W. M., Buffart, L. M., & Lenos, K. J. (2022). Behavioral factors to modulate immunotherapy efficacy in cancer. *Frontiers in immunology*, 13, 1066359.
 29. Kazdin, A. E., & Blase, S. L. (2011). Rebooting psychotherapy research and practice to reduce the burden of mental illness. *Perspectives on psychological science*, 6(1), 21-37.
 30. Kazdin, A. E., & Rabbitt, S. M. (2013). Novel models for delivering mental health services and reducing the burdens of mental illness. *Clinical Psychological Science*, 1(2), 170-191.
 31. Kazdin, A. E., & Rabbitt, S. M. (2013). Novel models for delivering mental health services and reducing the burdens of mental illness. *Clinical Psychological Science*, 1(2), 170-191.
 32. Kiecolt-Glaser, J. K., McGuire, L., Robles, T. F., & Glaser, R. (2002). Emotions, morbidity, and mortality: New perspectives from psychoneuroimmunology. *Annual review of psychology*, 53(1), 83-107.
 33. Levy, N. (2014). Forced to be free? Increasing patient autonomy by constraining it. *Journal of Medical Ethics*, 40(5), 293-300.
 34. Little, M., & Sayers, E. J. (2004). While there is life...: hope and the experience of cancer. *Social science & medicine*, 59(6), 1329-1337.
 35. Loftus, T. J., Filiberto, A. C., Rosenthal, M. D., Arnaoutakis, G. J., Sarosi Jr, G. A., Dimick, J. B., & Upchurch Jr, G. R. (2020). Performance advantages for grit and optimism. *The American Journal of Surgery*, 220(1), 10-18.
 36. Maj, M., Stein, D. J., Parker, G., Zimmerman, M., Fava, G. A., De Hert, M., ... & Wittchen, H. U. (2020). The clinical characterization of adult patients with depression is aimed at the personalization of management. *World Psychiatry*, 19(3), 269-293.
 37. Mani, M., Kavanagh, D. J., Hides, L., & Stoyanov, S. R. (2015). Review and evaluation of mindfulness-based iPhone apps. *JMIR mHealth and uHealth*, 3(3), e4328.
 38. Mar, R. A., & Oatley, K. (2008). The function of fiction is the abstraction and simulation of social experience. *Perspectives on psychological science*, 3(3), 173-192.
 39. Martínez-Martí, M. L., & Ruch, W. (2017). Character strengths predict resilience over and above positive affect, self-efficacy, optimism, social support, self-esteem, and life satisfaction. *The Journal of Positive Psychology*, 12(2), 110-119.
 40. Nasir, A., Khan, A., Li, J., Naeem, M., Khalil, A. A., Khan, K., & Qasim, M. (2021). Nanotechnology is a tool for diagnostics and treatment of cancer. *Current topics in medicinal chemistry*, 21(15), 1360-1376.
 41. Naylor, C., Das, P., Ross, S., Honeyman, M., Thompson, J., & Gilbert, H. (2016). Bringing together physical and mental health. *King's Fund*, 109(10), 364-366.
 42. Olawade, D. B., Wada, O. Z., Odetayo, A., David-Olawade, A. C., Asaolu, F., & Eberhardt, J. (2024). Enhancing mental health with Artificial Intelligence: Current trends and prospects. *Journal of medicine, surgery, and public health*, 100099.
 43. Ortega, M. A., García-Montero, C., Fraile-Martínez, O., Alvarez-Mon, M. A., Gómez-Lahoz, A. M., Lahera, G., ... & Álvarez-Mon, M. (2022). Immune-mediated diseases from the point of view of psychoneuroimmunoendocrinology. *Biology*, 11(7), 973.
 44. Ortega, M. A., García-Montero, C., Fraile-Martínez, O., Alvarez-Mon, M. A., Gómez-Lahoz, A. M., Lahera, G., ... & Álvarez-Mon, M. (2022). Immune-mediated diseases from the point of view of psychoneuroimmunoendocrinology. *Biology*, 11(7), 973.
 45. Panter-Brick, C., & Eggerman, M. (2011). Understanding culture, resilience, and mental health: The production of hope. In *The social ecology of resilience: A handbook of theory and practice* (pp. 369-386). New York, NY: Springer, New York.

46. Park, R., Shaw, J. W., Korn, A., & McAuliffe, J. (2020). The value of immunotherapy for survivors of stage IV non-small cell lung cancer: patient perspectives on quality of life. *Journal of Cancer Survivorship*, pp. 14, 363–376.
47. Rahman, M. M., Behl, T., Islam, M. R., Alam, M. N., Islam, M. M., Albarrati, A., ... & Bungau, S. G. (2022). Emerging management approach for the adverse events of immunotherapy of cancer. *Molecules*, 27(12), 3798.
48. Rasool, S., Ali, M., Shahroz, H. M., Hussain, H. K., & Gill, A. Y. (2024). Innovations in AI-Powered Healthcare: Transforming Cancer Treatment with Innovative Methods. *BULLET: Jurnal Multidisiplin Ilmu*, 3(1), 118-128.
49. Rohan, J. M., & Verma, T. (2020). Psychological considerations in pediatric chronic illness: case examples. *International Journal of Environmental Research and Public Health*, 17(5), 1644.
50. Salmon, J. W., Thompson, S. L., Salmon, J. W., & Thompson, S. L. (2021). Big data: information technology as control over the profession of medicine. *The Corporatization of American Health Care: The Rise of Corporate Hegemony and the Loss of Professional Autonomy*, pp. 181–254.
51. Seiler, A., & Jenewein, J. (2019). Resilience in cancer patients. *Frontiers in psychiatry*, 10, 208.
52. Shareef, M. A., Kumar, V., Dwivedi, Y. K., Kumar, U., Akram, M. S., & Raman, R. (2021). A new health care system enabled by machine intelligence: Elderly people's trust or losing self control. *Technological Forecasting and Social Change*, p. 162, 120334.
53. Sharf, B. F., & Vanderford, M. L. (2003). Illness narratives and the social construction of health. In *The Routledge Handbook of health communication* (pp. 23-48). Routledge.
54. Standish, L. J., Malani, S. M., Lynch, K., Whinkin, E. J., McCotter, C. M., Lynch, D. A., & Aggarwal, S. K. (2023). Integrative oncology's 30th anniversary: What have we achieved? A North American naturopathic oncology perspective. *Integrative Cancer Therapies*, p. 22, 15347354231178911.
55. Stein, K. D., Syrjala, K. L., & Andrykowski, M. A. (2008). Physical and psychological long-term and late effects of cancer. *Cancer*, 112(S11), 2577-2592.
56. Tavakolpour, S., & Karami, F. (2021). Cancer nanomedicine: Special focus on cancer immunotherapy. *Cancer Immunology: Bench to Bedside Immunotherapy of Cancers*, 465-508.
57. Temel, J. S., Petrillo, L. A., & Greer, J. A. (2022). Patient-centered palliative care for patients with advanced lung cancer. *Journal of Clinical Oncology*, 40(6), 626–634.
58. Tribe, R., & Bell, D. (2018). Social justice, diversity, and leadership. *The European Journal of Counselling Psychology*, 7(1), 111-125.
59. Turk, D. C., Fillingim, R. B., Ohrbach, R., & Patel, K. V. (2016). Assessment of the psychosocial and functional impact of chronic pain. *The Journal of Pain*, 17(9), T21-T49.
60. van Dulmen, S., Sluijs, E., Van Dijk, L., de Ridder, D., Heerdink, R., & Bensing, J. (2007). Patient adherence to medical treatment: a review of reviews. *BMC health services research*, 7, 1-13.
61. Weeks, J. C., Catalano, P. J., Cronin, A., Finkelman, M. D., Mack, J. W., Keating, N. L., & Schrag, D. (2012). Patients' expectations about effects of chemotherapy for advanced cancer. *New England Journal of Medicine*, 367(17), 1616-1625.
62. Williams, D. R., Mohammed, S. A., Leavell, J., & Collins, C. (2010). Race, socioeconomic status, and health: complexities, ongoing challenges, and research opportunities. *Annals of the New York Academy of Sciences*, 1186(1), 69–101.
63. Yazdanpanah, N., Mojtavavi, H., Ziaei, H., Pirkoohi, Z. R., Rayzan, E., & Rezaei, N. (2022). The clinical benefits of art therapy: definition, history, and outcomes with a focus on music therapy. In *Multidisciplinarity and interdisciplinarity in health* (pp. 457-482). Cham: Springer International Publishing.