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The science of resilience – From trauma to recovery

Pratibha Patel

Department of Pharmaceutics, Odisha University of Health Sciences, Bhubaneswar, Odisha, India

ABSTRACT

Resilience, the capacity to adapt and recover from trauma, is a complex, multidimensional process shaped by biological, psychological, and social factors. Trauma, whether acute, chronic, or developmental, disrupts normal physiological and psychological functioning, often leading to conditions such as post-traumatic stress disorder (PTSD), anxiety, and depression. However, research indicates that resilience can mitigate these adverse effects through mechanisms such as cognitive flexibility, emotional regulation, and robust social support systems. Neuroscientific studies reveal that resilience is associated with adaptive neuroplastic changes in key brain regions, including the prefrontal cortex, hippocampus, and amygdala, which regulate emotional processing and stress responses. Moreover, genetic factors, such as polymorphisms in stress-regulation genes, interact with environmental influences, including early-life experiences and social support, to shape an individual's resilience capacity. Psychological interventions, particularly Cognitive Behavioral Therapy (CBT) and Eye Movement Desensitization and Reprocessing (EMDR), have demonstrated efficacy in enhancing resilience by restructuring maladaptive thought patterns and facilitating the processing of traumatic memories. Additionally, maintaining physical health through adequate sleep, nutrition, and exercise plays a critical role in trauma recovery by modulating neuroendocrine responses and reducing stress-related physiological burden.Despite advancements in resilience research, defining and assessing resilience remains challenging due to variations in individual experiences, cultural contexts, and socio-economic factors. The lack of standardized intervention protocols further complicates clinical application. Future studies should focus on developing culturally sensitive, evidence-based resilience-building strategies across clinical, educational, and community settings to optimize trauma recovery outcomes. Integrating resilience science into therapeutic and societal frameworks is essential for enhancing long-term mental health and fostering adaptive recovery following trauma.

KEYWORDS

Resilience; Trauma; Neuroplasticity; Cognitive behavioral therapy (CBT); Stress regulation

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Introduction

Resilience, the ability to recover from and adapt to adversity has emerged as a central concept in understanding trauma and mental health recovery. It represents a dynamic process that enables individuals to withstand the impact of traumatic events such as abuse, natural disasters, or combat. Recent advances in neuroscience and psychology have shown that resilience is not a static trait but rather a complex interaction of biological, psychological and environmental factors that shape how individuals respond to trauma. The concept is particularly important in the context of increasing recognition of the long-term effects of trauma such as post-traumatic stress disorder (PTSD), anxiety, and depression [1].

Trauma can have profound and lasting effects on both the brain and the body. Traumatic experiences trigger stress responses that disrupt normal physiological and psychological functioning. However, some individuals exhibit remarkable resilience adapting and thriving despite these challenges. Research on resilience examines the factors that influence an individual's ability to overcome adversity and recover from traumatic experiences. Resilience is no longer viewed as merely surviving trauma but as a multifaceted process that involves recovery, growth and even transformation. This understanding has significant implications for mental health, as resilience plays a crucial role in mitigating the long-term effects of trauma and promoting recovery [2].

In recent years, resilience research has expanded across various disciplines including psychology, neuroscience and psychiatry. Studies have shown that resilience is influenced by a range of factors including genetics, neuroplasticity and social support systems. For example neuroimaging studies have highlighted how resilient individuals exhibit adaptive changes in brain regions associated with emotional regulation and stress response [3]. Furthermore, research has demonstrated that resilience is not only individual trait but is shaped by environmental and societal factors such as community support and access to mental health services. However, there is still a lack of consensus on how to define measure and promote resilience across diverse populations. While some individuals naturally exhibit higher resilience, others may face greater challenges due to external factors such as socio-economic status or previous exposure to trauma [4].

Despite the growing body of research several challenges persist in understanding resilience. One key limitation is the difficulty in measuring resilience consistently across studies.

***Correspondence:** Ms. Pratibha Patel, Odisha University of Health Sciences, Bhubaneswar, Odisha, India, e-mail: pratibhap199@gmail.com

The subjective nature of resilience influenced by personal experiences, cultural backgrounds and trauma types which complicates its assessment. Also current interventions focused on fostering resilience often lack standardization and their effectiveness remains uncertain in different settings [5]. Therefore, the objective of this review is to explore the scientific underpinnings of resilience particularly in its role in trauma recovery. This research attempts to provide insights into how resilience can be nurtured to support effective recovery from trauma by analyzing the biological, psychological, and social aspects that contribute to resilience. This will allow for a more complex approach to therapy and intervention strategies [6].

Understanding Trauma

Types of trauma

Trauma can be classified in several distinct categories, each with its own implications for mental and physical health. Acute trauma refers to a single or severe incident such as a violent assault, a car accident, or a natural disaster. In contrast chronic trauma involves repeated or prolonged exposure to stressors such as on-going domestic violence, childhood neglect, or long-term emotional abuse. Another important distinction is between physical and psychological trauma. Physical trauma such as bodily injury from an accident or war often results in direct damage to the body, while psychological trauma affects the mind and emotions including experiences like sexual assault or witnessing violence [7]. Additionally developmental trauma occurs during critical periods of a person's life, particularly in childhood and includes early life experiences like neglect or abuse that may disrupt normal psychological and emotional development. Situational trauma is tied to specific often sudden events such as war, terrorist attacks or the death of a loved one and can deeply affect an individual's sense of safety and well-being. The effects of these traumatic experiences can vary widely, depending on the nature, duration and timing of exposure [8].

The impact of trauma on the brain and body

Trauma has a profound effect on the brain leading to changes in structures responsible for emotional regulation, memory and cognitive function. The amygdala a brain region involved in processing emotions particularly fears become hyperactive in individuals who experience trauma. This excessive activity contributes to heightened emotional responses such as anxiety and fear even in non-threatening situations. Similarly, trauma can reduce the size and functioning of the hippocampus which is crucial for memory processing and emotional regulation [9]. This reduction impairs the ability to distinguish between past and present experiences leading to symptoms like flashbacks or intrusive memories in conditions like PTSD. Trauma also affects the prefrontal cortex the area of the brain responsible for decision-making, reasoning and controlling emotional responses. A decrease in prefrontal cortex activity can lead to impaired judgment, impulsivity and difficulty regulating emotional reactions, common in individuals with trauma-related disorders [10].

On a physiological level trauma activates the hypothalamic-pituitary-adrenal (HPA) axis triggering the release of stress hormones such as cortisol. This cascade of stress hormones prepares the body for a "fight-or-flight" response, temporarily increasing heart rate, blood pressure and energy levels. However, when trauma is chronic this system remains activated leading to prolonged stress responses that can negatively affect the cardiovascular system, immune function and metabolic processes which increasing the risk of physical health problems like hypertension, diabetes and autoimmune disorders [11]. Furthermore, trauma's long-lasting effects on the brain and body contribute to emotional disturbances such as depression, anxiety and mood disorders, along with cognitive impairments, including difficulties in memory and concentration. Psychological outcomes often include hyper vigilance, emotional numbing and a heightened sense of threat, which are key features of PTSD and other trauma-related conditions [12].

Trauma and mental health disorders

The relationship between trauma and the development of mental health disorders is well-documented. Trauma especially when it is severe or prolonged is a major risk factor for the onset of disorders like PTSD, depression, and anxiety. PTSD in particular is directly linked to the experience of traumatic events leading to symptoms such as intrusive thoughts, nightmares and heightened arousal. Other mental health issues such as depression and anxiety can also emerge following trauma, as the body's persistent stress response disrupts emotional stability and cognitive functioning [13]. In individuals who experience trauma the on-going emotional and physiological stress can lead to long-term changes in brain chemistry, making them more susceptible to these mental health conditions. Effective treatment and early intervention are essential in managing trauma's impact on mental health as resilience-building strategies that including therapy and medication which can help mitigate these effects and support recovery [14].

The Science of Resilience

Resilience is the ability to adapt positively or recover from adversity, trauma, or significant stress. It is often misunderstood as mere survival however resilience involves an active process of bouncing back adjusting and even thriving despite hardships. Unlike resistance which implies an ability to withstand or avoid harm, resilience requires an individual to overcome challenges while maintaining or restoring emotional and psychological well-being. Research indicates that resilience is not an innate quality but a dynamic, developmental process that is influenced by individual traits, social networks and broader environmental contexts. The concept extends beyond "surviving" trauma, highlighting the role of adaptation and personal growth [15].
Various theoretical frameworks contribute to our understanding of resilience emphasizing the complex interplay of individual, environmental and societal factors. The ecological model for instance, examines how resilience emerges from interactions between an individual and their immediate surroundings, including family, community, and societal structures. This model suggests that resilience is influenced by both individual characteristics (e.g., temperament, cognitive abilities) and the external environment, including socioeconomic conditions, family dynamics, and community resources [16].

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Ann Masten's "Ordinary Magic" theory posits that resilience is not a rare extraordinary trait but an ordinary process that exists in all individuals. Masten argues that resilience arises from adaptive systems that are common in humans such as emotional regulation and problem-solving abilities which are shaped by supportive environments and positive experiences. Similarly, Michael Rutter's research stresses the role of protective factors such as stable relationships and positive environments in fostering resilience. Rutter's approach is lifespan-oriented suggesting that resilience may manifest differently across various life stages with different risks and protective factors influencing resilience at different times. He also highlights the importance of "turning point experiences"—significant life events that reshape an individual's path toward resilience [17].
These theories collectively underscore the multidimensional nature of resilience, illustrating how it is not a static trait but a process influenced by genetic, environmental, and contextual factors. Understanding these frameworks is essential in creating interventions that can enhance resilience at both the individual and community levels [18].

Factors that influence resilience

The development of resilience is influenced by a combination of genetic, individual, social, and environmental factors. These elements can serve as either protective or risk factors in an individual's ability to adapt to or recover from adversity. Understanding the specific factors involved can help in the design of interventions aimed at enhancing resilience in vulnerable populations [19].

Individual factors

Genetic predispositions are key determinants of how individuals respond to stress and trauma. Variations in genes related to the neuropeptide Y (NPY), HPA axis and neurotransmitter systems have been linked to resilience. For instance genetic variations in NPY have been associated with the ability to manage stress and recover from trauma. NPY has anxiolytic properties and facilitates stress resistance with certain polymorphisms influencing individual responses to stress. Similarly the HPA axis plays a crucial role in how the body responds to stress. Polymorphisms in genes such as CRHR1 and FKBP5 influence cortisol regulation and can interact with early-life trauma affecting the long-term risk for mental health issues such as PTSD and depression [20].

In addition to genetic factors personality traits such as optimism, self-esteem and problem-solving abilities can significantly influence resilience. Optimistic individuals are more likely to view stress as manageable and use adaptive coping strategies. Hardiness encompasses a combination of commitment, control and challenge enabling individuals to perceive adversity as opportunities for growth rather than threats. Research indicates that hardy individuals tend to have a more robust psychological response to stress facilitating faster recovery. Thus, individual factors such as genetics and personality contribute significantly to resilience by influencing stress perceptions and coping strategies [21].

Social and environmental factors

While individual traits are crucial social support and environmental factors are equally important in fostering resilience. Family, community support and social networks provide essential emotional and practical resources that buffer against the effects of trauma. Studies consistently show that positive familiar relationships including nurturing parent-child bonds promote better mental health outcomes by enhancing emotional regulation and coping strategies. Communities that offer safe environments and promote social connections serve as protective factors for individuals exposed to trauma facilitating their recovery and adaptation. Research highlights that strong community ties and social cohesion increase resilience particularly in the aftermath of natural disasters and other traumatic events [22].

The socio-economic environment also plays a significant role in shaping resilience. Disadvantaged socio-economic conditions often expose individuals to additional stressors such as economic hardship, poor housing or limited access to health care. All of which can undermine resilience. However, access to education, healthcare and stable housing can provide critical protective resources that enable individuals to overcome adversity. Additionally, cultural factors influence how resilience is understood and expressed. For example, in collectivist cultures resilience is often linked to communal support systems whereas in individualistic cultures the personal autonomy and individual coping mechanisms are emphasized. Thus, the interplay between socio-economic conditions and cultural expectations shapes how resilience manifests in different populations [23].

Contextual and situational factors

The nature, severity and timing of trauma also profoundly impact resilience. Research suggests that trauma experienced during critical developmental stages particularly in childhood can have long-lasting effects on resilience. For instance early childhood adversities such as abuse or neglect can hinder the development of adaptive coping strategies making it harder for individuals to recover from future stressors. The timing of trauma is particularly crucial because experiences during sensitive periods of development can interfere with neurological and psychological development leading to increased vulnerability later in life. However, the presence of protective factors such as a supportive caregiver or stable environment can mitigate these effects allowing individuals to develop resilience despite early adversity [24].

Moreover, the severity and nature of the trauma play a crucial role in shaping resilience. Traumas that involve loss, violence or chronic stress can have more profound and lasting effects than situational or acute stressors. For example, the experience of war, abuse or natural disasters often leads to more severe psychological consequences such as PTSD or depression compared to short-term, less severe trauma. Additionally, individual circumstances such as prior experiences of trauma or pre-existing mental health conditions can influence how an individual responds to stress. Trauma experienced in early life often results in more complex psychological outcomes compared to trauma encountered in adulthood suggesting that early intervention can be in preventing the development of more severe mental health issues later in life [25].

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Pathways to Recovery: The Role of Resilience

Recovery from trauma involves a complex interplay of psychological and physical components with resilience serving as a critical factor in guiding individuals through this process. Understanding the stages and mechanisms of recovery is essential for developing effective therapeutic strategies. Resilience not only aids in psychological recovery but also supports physical healing, allowing individuals to regain a sense of control and functionality post-trauma. This section explores how resilience contributes to both psychological and physical recovery as well as the long-term maintenance of well-being [26].

Psychological recovery

The psychological recovery process from trauma typically unfolds in stages, starting with an initial state of shock and disbelief. Over time, individuals begin to confront their trauma, move through periods of emotional distress and ultimately arrive at acceptance and integration of the experience into their life narratives. Therapeutic interventions play a central role in this process, helping individuals address and process traumatic memories. Cognitive Behavioral Therapy (CBT) is one of the most widely researched and effective approaches for trauma recovery. Studies consistently show that CBT can reduce symptoms of post-traumatic stress disorder (PTSD) by helping individuals challenge and reframe maladaptive thoughts related to their trauma. Additionally, Eye Movement Desensitization and Reprocessing (EMDR) has shown significant efficacy in reducing trauma-related symptoms, particularly for those who have not responded to traditional therapies. Trauma-Focused Therapy (TFT), another evidence-based treatment, works by directly addressing the trauma and helping individuals process emotions linked to the event, leading to greater emotional regulation and resilience [27].

These therapies help individuals confront and reprocess traumatic memories, reducing their emotional charge and enabling them to regain a sense of control. As individuals process trauma, resilience is built through cognitive restructuring and emotional regulation, which strengthens the capacity to deal with future stressors. Emotional processing and adaptive coping strategies are central components of psychological resilience allowing individuals to integrate their trauma in a healthy and functional way [28].

Physical recovery

While psychological recovery is critical, physical health also plays a pivotal role in supporting trauma recovery. Trauma often triggers a heightened stress response which can lead to physical consequences such as elevated levels of cortisol and disruption to neuroendocrine functioning. These physiological responses can impair the body's ability to heal emotionally. Therefore, addressing physical health is vital to the recovery process. Proper sleep, nutrition and exercise are integral to maintaining emotional stability during recovery [29].

Sleep is particularly important for both physical and emotional well-being. It is essential for memory consolidation and emotional regulation, both of which are disrupted after trauma. Research has shown that inadequate sleep exacerbates PTSD symptoms and impairs emotional processing. Exercise is another powerful tool in trauma recovery. Physical activity triggers the release of endorphins which can improve mood and reduce symptoms of anxiety and depression that are common in trauma survivors. Moreover, nutrition plays a vital role in maintaining overall health. A well-balanced diet supports brain function and regulates the stress response, helping to mitigate the adverse effects of chronic stress on the body [30].

Incorporating self-care practices such as yoga, mindfulness and relaxation techniques can further help to regulate stress levels. Together, these physical recovery strategies complement the psychological processes of healing, contributing to a more holistic and sustained recovery [31].

Building long-term resilience

Building long-term resilience is essential for sustaining recovery and promoting well-being after trauma. While initial recovery focuses on addressing the acute effects of trauma, long-term resilience involves the on-going development of emotional intelligence, mindfulness and social connections. Mindfulness-based practices such as meditation and deep-breathing exercises have been shown to reduce symptoms of anxiety, depression and PTSD by improving emotional regulation. These practices promote present-moment awareness and help individual process trauma in a way that reduces emotional reactivity [32].

Emotional intelligence or the ability to recognize, understand and manage one's emotions is another key factor in building resilience. Studies have demonstrated that individual with higher emotional intelligence are better equipped to manage with stress and recover from trauma. Developing emotional intelligence can help individuals reframe their trauma in a way that fosters growth and healing [33]. In addition to emotional growth, the role of social support cannot be overstated. Strong social bonds provide individuals with the emotional resources needed to navigate life's challenges. Social support has been shown to mitigate the effects of trauma and facilitate recovery, particularly in preventing the onset of PTSD. Social networks, family and communities offer individuals a sense of security and connectedness which are crucial for maintaining resilience in the long term [34].

Practical strategies for fostering long-term resilience include journaling, which allows individuals to reflect on their experiences and emotional growth and therapy for constant support and guidance. Support groups can also provide a platform for sharing experiences and learning from others who have experienced similar struggles [35].

Application of Resilience Science in Practice

Resilience science has gained significant attention for its practical applications across various fields including mental health treatment, education, workplaces and community development. By leveraging research on resilience these areas aim to build adaptive capacities that help individuals and groups deal with and recover from trauma. Below, we explore how resilience science is being integrated into therapeutic practices, educational systems, workplaces and community recovery efforts [36].

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In mental health treatment

Resilience-building strategies are increasingly incorporated into therapeutic practices, especially in trauma-informed care (TIC). TIC emphasizes the importance of understanding the widespread impact of trauma on individuals and creating an environment that promotes safety, trust and empowerment. This approach is crucial in mental health treatment particularly for individuals with a history of trauma or abuse. Therapeutic methods such as Cognitive behavioral Therapy (CBT), Eye Movement Desensitization and Reprocessing (EMDR) and Trauma-Focused Cognitive behavioral Therapy (TF-CBT) are widely used to help individuals process their trauma and foster resilience. Studies have demonstrated that CBT is effective in helping individuals reframe negative thought patterns associated with trauma, while EMDR is beneficial in processing traumatic memories [37].

In addition to these methods, a growing focus on integrating mindfulness-based practices within therapy has proven effective in promoting emotional regulation and building resilience. Mindfulness helps individuals increase their self-awareness and emotional tolerance, essential components for trauma recovery. Overall, trauma-informed therapeutic strategies aim to address the psychological impacts of trauma and help individuals develop coping skills ultimately building resilience over time [38].

In education and the workplace

In educational settings resilience science is being used to develop programs that help students build coping strategies for managing stress and adversity. Programs that incorporate social-emotional learning (SEL), mindfulness practices and resilience training are now becoming standard in schools. For example, studies have shown that SEL programs improve emotional regulation, social skills and academic performance, all of which contribute to resilience. These programs help children understand and manage their emotions to deal with stress and develop interpersonal skills all of which are critical for building long-term resilience [39].

Similarly in workplaces the application of resilience science is increasingly recognized as essential for employee well-being. Corporate wellness programs that focus on resilience training, stress management and mindfulness are designed to support employees' mental and physical health. Evidence suggests that such programs improve not only mental health but also workplace productivity and job satisfaction. By incorporating resilience-building strategies organizations help employees develop better coping skills, reduce stress, tension and increase their overall capacity to manage stress [40].

Resilience in Communities

Resilience science also has applications in community development particularly in post-disaster recovery and conflict zones. In these contexts the community resilience focuses on rebuilding social networks, fostering collective coping mechanisms, and enhancing social support systems. For example, in the consequences of natural disasters or conflicts community-based resilience programs help individuals and groups recover by re-establishing a sense of community, security and belonging. Research indicates that social connectedness is a key factor in community resilience as it provides individuals with emotional support and practical resources during times of adversity [41].

In areas affected by conflict resilience-building efforts often involve community healing programs that promote social cohesion, restore trust and address the psychological impacts of trauma. Programs designed to enhance community engagement, leadership and resource-sharing are crucial for empowering communities to recover and thrive in the face of on-going challenges [42].

Challenges and Criticisms of Resilience Research

While resilience research has offered valuable insights into trauma recovery it is not without its criticisms particularly regarding its emphasis on individual resilience. One of the main criticisms is that focusing too heavily on individual resilience often neglects broader societal factors such as inequality, discrimination and environmental influences. For example, while some resilience models like the ecological model emphasize the interplay between individual traits and environmental contexts. Much of the research tends to center on internal factors like personality and coping mechanisms. This individual-focused perspective may inadvertently shift the responsibility for recovery solely onto the individual, overlooking systemic issues that limit an individual's ability to recover such as poverty or societal discrimination. Critics argue that this perspective risks promoting the idea that individuals are solely responsible for their resilience despite the critical role of supportive environments [43].

Limitations in Measuring Resilience

The field of resilience research also faces significant methodological challenges, particularly when it comes to defining and measuring resilience. The lack of a universally accepted definition of resilience complicates efforts to compare and contrast findings across studies. Different resilience scales such as the Connor-Davidson Resilience Scale and the Resilience Scale for Adults measure resilience in variable ways making it difficult to draw clear conclusions about its effectiveness. Furthermore, resilience is often studied as a static unidimensional trait despite the fact that it is a dynamic multifaceted process influenced by both individual and environmental factors. As a result, resilience cannot be fully captured by any single tool or theoretical framework thus complicating its measurement and interpretation [44].

In addition to these issues the absence of longitudinal studies poses a significant challenge in understanding the long-term dynamics of resilience. Resilience is not a fixed characteristic but rather an evolving process that can change over time in response to on-going adversities. Longitudinal studies are essential for capturing how resilience develops and adapts over the course of an individual's life but the scarcity of such studies limits our understanding of resilience as a time-dependent process. The lack of long-term research also restricts our ability to fully understand the mechanisms by which resilience operates and whether it can be sustained over extended periods of adversity [45].

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Conclusions

The relationship between trauma and resilience is complex and multifaceted. The review highlights that resilience is not a fixed trait but a dynamic process shaped by various psychological, social, and biological factors. Psychological resilience, as evidenced by research, plays a pivotal role in facilitating recovery from trauma. Key elements, such as emotional regulation, social support, and physical health, contribute significantly to long-term resilience. Studies have demonstrated that resilience can mitigate the long-term effects of trauma, with resilient individuals exhibiting better outcomes in mental health, despite exposure to adversity. Future research must focus on resilience across diverse populations, examining how cultural, socio-economic, and environmental factors interact with individual resilience mechanisms. Longitudinal studies could explore how resilience evolves over time, with a focus on specific populations, including racial minorities and refugees, who face unique challenges in recovery. Another area of interest is the role of technology in promoting resilience. Digital platforms, including virtual therapy and mobile applications designed for mental health support, could be explored as tools for building resilience in vulnerable groups. The importance of resilience cannot be overstated when it comes to trauma recovery. As we continue to better understand the scientific foundations of resilience, integrating resilience-building strategies in clinical, educational, and community settings will be critical. These interventions not only aid in individual recovery but also promote societal well-being by empowering individuals to face adversity with strength and adaptability. Building resilience is essential for mitigating the effects of trauma, fostering long-term recovery, and promoting healthier societies.

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References

1. Roeckner AR, Oliver KI, Lebois LA, van Rooij SJ, Stevens JS. Neural contributors to trauma resilience: a review of longitudinal neuroimaging studies. Transl Psychiatry. 2021;11(1):508. https://doi.org/10.1038/s41398-021-01633-y
2. Oliaei Far S. Trauma, Resilience and Mental Health Disparities: Lit Rev. 2023. https://dx.doi.org/10.2139/ssrn.4602769
3. Kalisch R, Russo SJ, Müller MB. Neurobiology and systems biology of stress resilience. Physiol Rev. 2024;104(3):1205-1263. https://doi.org/10.1152/physrev.00042.2023
4. Terrana A, Al-Delaimy W. A systematic review of cross-cultural measures of resilience and its promotive and protective factors. Transcult Psychiatry. 2023;60(4):733-750. https://doi.org/10.1177/13634615231167661
5. Jefferies P. Measuring resilience: The Brief Resilience Scale. Academia Letters. 2021;1195. https://doi.org/10.20935/AL1195
6. Roeckner AR, Oliver KI, Lebois LA, van Rooij SJ, Stevens JS. Neural contributors to trauma resilience: a review of longitudinal neuroimaging studies. Transl Psychiatry. 2021;11(1):508. https://doi.org/10.1038/s41398-021-01633-y
7. Neuner F. Physical and social trauma: Towards an integrative transdiagnostic perspective on psychological trauma that involves threats to status and belonging. Clin Psychol Rev. 2023;99:102219. https://doi.org/10.1016/j.cpr.2022.102219
8. Frazier PA. Trauma psychology. https://doi.org/10.1093/oxfordhb/9780195342314.013.0031
9. Cacciaglia R, Nees F, Grimm O, Ridder S, Pohlack ST, Diener SJ, et al. Trauma exposure relates to heightened stress, altered amygdala morphology and deficient extinction learning: Implications for psychopathology. Psychoneuroendocrinology. 2017;76:19-28. https://doi.org/10.1016/j.psyneuen.2016.11.012
10. Harnett NG, Goodman AM, Knight DC. PTSD-related neuroimaging abnormalities in brain function, structure, and biochemistry. Exp Neurol. 2020; 330:113331. https://doi.org/10.1016/j.expneurol.2020.113331
11. Murphy F, Nasa A, Cullinane D, Raajakesary K, Gazzaz A, Sooknarine V, et al. Childhood trauma, the HPA axis and psychiatric illnesses: a targeted literature synthesis. Front Psychiatry. 2022;13:748372. https://doi.org/10.3389/fpsyt.2022.748372
12. Kuzminskaite E, Penninx BW, Van Harmelen AL, Elzinga BM, Hovens JG, Vinkers CH. Childhood trauma in adult depressive and anxiety disorders: an integrated review on psychological and biological mechanisms in the NESDA cohort. J Affect Disord. 2021;283:179-191. https://doi.org/10.1016/j.jad.2021.01.054
13. Lee JY, Kim SW, Kim JM. The impact of community disaster trauma: a focus on emerging research of PTSD and other mental health outcomes. Chonnam Med J. 2020;56(2):99. https://doi.org/10.4068/cmj.2020.56.2.99
14. Oliaei Far S. Trauma, Resilience and Mental Health Disparities: Lit Rev. Available at SSRN 4602769. 2023. https://dx.doi.org/10.2139/ssrn.4602769
15. Ong AD, Cammarata C. Resilience theory of, not just the trait dimension. The Wiley Encyclopedia of Personality and Individual Differences: Models and Theories. 2020;18:357-361. https://doi.org/10.1002/9781118970843.ch59
16. Collette A, Ungar M. Resilience of individuals, families, communities, and environments: Mutually dependent protective processes and complex systems. Systemic research in individual, couple, and family therapy and counseling. 2020;97-111. https://doi.org/10.1007/978-3-030-36560-8_6
17. Mancini JA. Observations on the relationship between resilience and mindfulness. Counseling and Family Therapy Scholarship Review. 2021;3(2):1. https://doi.org/10.53309/HAGG5814
18. Thibodeaux J. Conceptualizing multilevel research designs of resilience. J Community Psychol. 2021;49(5):1418-35. https://doi.org/10.1002/jcop.22598
19. Abate BB, Sendekie AK, Tadesse AW, Engdaw T, Mengesha A, Zemariam AB, Alamaw AW, Abebe G, Azmeraw M. Resilience after adversity: an umbrella review of adversity protective factors and resilience-promoting interventions. Front Psychiatry. 2024;15:1391312. https://doi.org/10.3389/fpsyt.2024.1391312
20. Maul S, Giegling I, Fabbri C, Corponi F, Serretti A, Rujescu D. Genetics of resilience: Implications from genome-wide association studies and candidate genes of the stress response system in posttraumatic stress disorder and depression. Am J Med Genet B Neuropsychiatr Genet. 2020;183(2):77-94. https://doi.org/10.1002/ajmg.b.32763
21. Iacoviello BM, Charney DS. Cognitive and behavioral components of resilience to stress. InStress resilience. 2020;23-31. Academic Press. https://doi.org/10.1016/B978-0-12-813983-7.00002-1
22. Daniels AD, Bryan J. Resilience despite complex trauma: Family environment and family cohesion as protective factors. Fam J. 2021;29(3):336-345. https://doi.org/10.1177/10664807211000719
23. Chernobrovkina V, Chernobrovkin V. The Phenomenon of Resilience in the Context of Socio-Ecological Approach and Discourse. Психологія та психосоціальні інтервенції. 2020;3: 59-66. https://doi.org/10.18523/2617-2348.2020.3.59-66
24. Matheson K, Asokumar A, Anisman H. Resilience: safety in the aftermath of traumatic stressor experiences. Front Behav Neurosci.

https://doi.org/10.61577/jmhbs.2025.100003

2020;14:596919. https://doi.org/10.3389/fnbeh.2020.596919
25. Roeckner AR, Oliver KI, Lebois LA, van Rooij SJ, Stevens JS. Neural contributors to trauma resilience: a review of longitudinal neuroimaging studies. Transl Psychiatry. 2021;11(1):508. https://doi.org/10.1038/s41398-021-01633-y
26. Echezarraga A, Las Hayas C, López de Arroyabe E, Jones SH. Resilience and recovery in the context of psychological disorders. J Humanist Psychol. 2024;64(3):465-488. https://doi.org/10.1177/0022167819851623
27. Mavranezouli I, Megnin-Viggars O, Daly C, Dias S, Welton NJ, Stockton S, Bhutani G, Grey N, Leach J, Greenberg N, Katona C. Psychological treatments for post-traumatic stress disorder in adults: A network meta-analysis. Psychol Med. 2020;50(4):542-555. https://doi.org/10.1017/S0033291720000070
28. Lewis C, Roberts NP, Andrew M, Starling E, Bisson JI. Psychological therapies for post-traumatic stress disorder in adults: Systematic review and meta-analysis. Eur J Psychotraumatol. 2020;11(1): 1729633. https://doi.org/10.1080/20008198.2020.1729633
29. Lopez-Martinez AE, Serrano-Ibanez ER, Ruiz-Párraga GT, Gomez-Perez L, Ramirez-Maestre C, Esteve R. Physical health consequences of interpersonal trauma: A systematic review of the role of psychological variables. TRAUMA VIOLENCE ABUS. 2018;19(3):305-322. https://doi.org/10.1177/1524838016659488
30. Anbari BS. Physical exercise fosters recovery from negative stressors: the impact on sleep quality and mental health for trauma victims (Doctoral dissertation). https://hdl.handle.net/1946/35962
31. Hilcove K, Marceau C, Thekdi P, Larkey L, Brewer MA, Jones K. Holistic nursing in practice: mindfulness-based yoga as an intervention to manage stress and burnout. J Holist Nurs. 2021; 39(1):29-42. https://doi.org/10.1177/0898010120921587
32. Joyce S, Shand F, Tighe J, Laurent SJ, Bryant RA, Harvey SB. Road to resilience: a systematic review and meta-analysis of resilience training programmes and interventions. BMJ open. 2018;8(6):e017858. https://doi.org/10.1136/bmjopen-2017-017858
33. Sharma A, Jha A. The Role of Emotional Intelligence in Fostering Employee Engagement and Resilience. http://localhost:8080/xmlui/handle/123456789/592
34. Nguyen H, Pope D, Harms L. Long-term post-traumatic growth after natural disasters: A scoping review of contextual influences. Br J Soc Work. 2023;53(5):2705-2724. https://doi.org/10.1093/bjsw/bcac240
35. Rivera, A., de Rooij, A., Jones, S. (2020). Reflective Journaling: A Theoretical Model and Digital Prototype for Developing Resilience and Creativity. In: Zaphiris, P., Ioannou, A. (eds) Learning and Collaboration Technologies. Designing, Developing and Deploying Learning Experiences. HCII 2020. Lecture Notes in Computer Science(), 12205. Springer, Cham. https://doi.org/10.1007/978-3-030-50513-4_11
36. Reyers B, Moore ML, Haider LJ, Schlüter M. The contributions of resilience to reshaping sustainable development. Nat Sustain. 2022;5(8):657-664. https://doi.org/10.1038/s41893-022-00889-6
37. Saunders KR, McGuinness E, Barnett P, Foye U, Sears J, Carlisle S, et al. A scoping review of trauma informed approaches in acute, crisis, emergency, and residential mental health care. BMC psych. 2023; 23(1):567. https://doi.org/10.1186/s12888-023-05016-z
38. Costello CM, Walters ME. Integrating resiliency into neurobiologically-focused mental health counseling through mindfulness. J Creat Ment Health. 2022;17(3):350-362. https://doi.org/10.1080/15401383.2021.1892558
39. García-Parra M, Negre F, Verger S. Educational Programs to build resilience in children, adolescent or youth with disease or disability: A systematic review. Educ Sci 2021;11(9):464. https://doi.org/10.3390/educsci11090464
40. Kelly RK, Snow S. The importance of corporate wellness programs for psychological health and productivity in the workplace. InCreating Psychologically Healthy Workplaces. 2019;411-430. https://doi.org/10.4337/9781788113427.00030
41. DeMello A, Egan R, Drew J. Resilience-building by community health organizations: a guiding model for practice. J Roy Soc New Zealand. 2020;50(4):552-571. https://doi.org/10.1080/03036758.2020.1772324
42. Jay S, Winterburn M, Jha K, Sah AK, Choudhary R, Muldoon OT. A resilience building collaboration: A social identity empowerment approach to trauma management in leprosy-affected communities. Psychol Trauma Theory Res Pract Policy. 2022;14(6):940. https://psycnet.apa.org/doi/10.1037/tra0001160
43. Schwarz S. Resilience in psychology: A critical analysis of the concept. Theory Psychol. 2018; 28(4):528-541. https://doi.org/10.1177/0959354318783584
44. Rajendran A. Evolution of the Construct of Resilience: Challenges in Measurement. Indian J Health Stud. 2020;2:91-106. https://doi.org/10.56490/IJHS.2020.2206
45. Cosco TD, Kaushal A, Hardy R, Richards M, Kuh D, Stafford M. Operationalising resilience in longitudinal studies: a systematic review of methodological approaches. J Epidemiol Community Health. 2017;71(1):98-104. https://doi.org/10.1136/jech-2015-206980

https://doi.org/10.61577/jmhbs.2025.100003