Resilience: A psychobiological construct for psychiatric disorders

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ABSTRACT

Understanding of psychopathology of mental disorder is evolving, particularly with availability of newer insight from the field of genetics, epigenetics, social, and environmental pathology. It is now becoming clear how biological factors are contributing to development of an illness in the face of a number of psychosocial factors. Resilience is a psychobiological factor which determines individual’s response to adverse life events. Resilience is a human capacity to adapt swiftly and successfully to stressful/traumatic events and manage to revert to a positive state. It is fundamental for growth of positive psychology which deals with satisfaction, adaptability, contentment, and optimism in people’s life. Of late, there has been a paradigm shift in the understanding of resilience in context of stress risk vulnerability dimension. It is a neurobiological construct with significant neurobehavioral and emotional features which plays important role in deconstructing mechanism of biopsychosocial model of mental disorders. Resilience is a protective factor against development of mental disorder and a risk factor for a number of clinical conditions, e.g. suicide. Available information from scientific studies points out that resilience is modifiable factor which opens up avenues for a number of newer psychosocial as well as biological therapies. Early identification of vulnerable candidates and effectiveness of resilience-based intervention may offer more clarity in possibility of prevention. Future research may be crucial for preventive psychiatry. In this study, we aim to examine whether resilience is a psychopathological construct for mental disorder.

Key words: Clinical, neurobiology, psychiatric disorders, psychosocial, resilience

INTRODUCTION

Resilience is the capacity people have to adapt swiftly and successfully to stressful/traumatic events while not reverting to the original state. Resilience is described as an evolving process influenced by a variety of biological, social, and environmental factors.1 The growing evidence supports the notion that resilience is involved in the development of positive psychological traits.2 Various studies have illustrated the critical role of resilience on the individuals’ capacity to form a healthy response while enduring trauma, and this has been noted across all ages.3 Human beings have the capacity to protect themselves and deal with the adverse events or stimulus, which can challenge their psychobiological homeostasis. It is in this respect that resilience emerges as a factor which contributes as a defense mechanism and a protective factor.2 Resilience is a construct that may be involved in psychopathological process for mental disorder;4 it also mediates stress response of trauma;4 therefore, high level of resilience works a protective factor and lower level of resilience increases vulnerability for developing psychiatric disorders.
pathological consequences of adverse environmental events.\textsuperscript{[8]} Further, there is some evidence that indicate that resilience is modifiable, and this opens up possibility for novel therapeutic interventions.\textsuperscript{[6,7]} Therefore, if it is the case, then enhancing resilience may open novel possibilities for treating and preventing various mental disorders. A number of factors have been used to explain the resilient response to adverse life situation, and recent development in psychosociology and neurobiology provides more insight into this problem. Of late, there has been a paradigm shift in the understanding resilience which determines stress-risk vulnerability dimension. In this paper, we examine whether resilience is a psychopathological construct for mental disorder. We first examine its correlates (i.e., psychosocial or neurobiological); then we will explore how mental disorders correlate to resilience. In addition, we seek to explain why resilience has a greater effect on some individuals when compared to others. Finally, we will investigate the implications and ramifications of resilience in a clinical setting.

**PSYCHOSOCIAL FACTORS**

There is a strong argument which claims that response to trauma develops through resilience, and although some neurobiological changes correlate with resilience and trauma, it is unclear whether the nature and degree of response to trauma are dependent on extent neurobiological changes alone. The level for resilience protection and modification also depends on other complex factors that shape the influence resilience on individuals experiencing trauma.\textsuperscript{[8]} There are multiple factors influencing the "strength" of resilience which have not yet been determined. We believe that there are underlying cognitive features, which are strongly related to resilience, and may play a significant role in determining how appropriate and sufficient a response is, or how well the symptoms are minimized in a specific patient's case. Resilience is a human capacity to adapt swiftly and successfully to a stressful/traumatic events and manage to revert to a positive state.\textsuperscript{[9]} Therefore, resilience creates a potential preventative measure for mental illness has a critical effect on health status of individuals.

The capacity to which resilience is able to act as a preventative measure seems to have a strong correlation to ingrained psychosocial factors. The factors that act to maintain and uphold resilience are active coping, cognitive flexibility, and social support.\textsuperscript{[10]} Active coping is one's life long acquired ability to utilize psychological and behavioral resources to cope with trauma or stressors.\textsuperscript{[11]} Researchers have described active coping as a goal-directed response, mediated by the person to change the nature of the trauma or mitigate the negative effect that the trauma has on the person.\textsuperscript{[11]} Therefore, if a patient is placed in an environment that encourages healthy development of intrinsic psychological and behavioral traits, which promote healthy development of a person's active coping ability, then they are more at ease to use active coping as an effective form of resilience. In addition to active coping, cognitive flexibility also helps to develop and maintain the effectiveness of resilience in withstanding trauma.\textsuperscript{[12]} Human cognition is designed to adapt to rising challenges that comes from changing circumstances.\textsuperscript{[13]} Cognitive flexibility allows a person to dynamically adjust to external demands from trauma in order to mitigate potential harm. The ability to bend one's cognition to better deal with trauma arises from acquired knowledge which developed throughout one's life, and it forms the bases for flexibility in cognitive resilience.\textsuperscript{[14]} This acquired knowledge allows the individual to create a reservoir of important information that can provide a context through which new stimuli can be processed. Therefore, when trauma based stimuli occurs, an individual with a better-established reservoir of knowledge would potentially be more suited to be cognitively flexible to the arising problem and mitigate the harm caused by the trauma. Finally, the last factor that contributes to the makeup and function of resilience is social support.\textsuperscript{[14]} Resilience has been outlined as an ever-changing system that arises from interactions beyond the intrinsic factors of the individual.\textsuperscript{[15]} The social environment which the individual dwells in greatly impacts resilience since it allows positive response from the individual when they are confronted with challenges or threats.\textsuperscript{[16]} The quality of the social support significantly affects the individual's capacity for resilience. Authors have suggested that a person's social support aids in mitigating harm from trauma if the number of individuals in the person's network is greater, and also the significance of those relationships to the person and have concluded that social support, social activity, and quality of those social relationships are positively associated with greater global cognitive functioning.\textsuperscript{[17]} Therefore, it can be argued that the psychosocial relationship between the three closely related factors (active coping, cognitive flexibility, and social support) is the bases for the development, effective use, and maintenance of resilience in traumatic events. Furthermore, if the three factors are developed properly, then there is a greater likelihood for the individual to be defended against harm caused by trauma.

**NEUROBIOLOGICAL FACTORS**

Recent research has attempted to define resilience in biological terms, which provides a preliminary argument to support that it is an independent domain. The neuroscience of resilience is beginning to uncover the circuits and molecules that protect against stress-related neuropsychiatric diseases.\textsuperscript{[18]} Glucocorticoids (GCs) are important regulators of basal and stress-related homeostasis that influence a wide array of genes in almost every organ and tissue.\textsuperscript{[19]} GCs are ideally situated to either promote or prevent adaptation to stress. Literature on trauma has focused predominately on limbic and cortical structures that
innervate the hypothalamic-pituitary-adrenal (HPA) axis and influence GC-mediated negative feedback. It is through these neuroendocrine pathways that a self-perpetuating “fearful memory” can propagate the long-term effects of early life trauma.\textsuperscript{19} Neuronal systems underlying positive traits of an individual are being explored.\textsuperscript{20} Current investigations are being conducted in the direction of exploring role of neuronal systems in treatment and prevention of mental disorders. Central neurochemical response to trauma is HPA axes which governs, coordinates, and modulates various changes arising from its interaction with hypothalamic-pituitary-thyroid axis, corticotropin-releasing hormone, and corticotropin-releasing factor, to finally regulate neurotransmission mechanism.\textsuperscript{21} Neurochemical and neuroendocrine changes occurring in response to trauma may lead to neuronal loss and functional disconnectivity. Changes in neuroplasticity, HPA axis response to stress, neurotransmissions of dopamine, serotonin, and norepinephrine play an important role in maintaining homeostasis of resilience plasticity.\textsuperscript{22} The main neurochemical substance in this process is GCs. Neurochemical changes suggest that cortisol related sustained, enhancement of amygdala, and hippocampus may lead to loss of functional connectivity.\textsuperscript{23} Research of gene-environmental integration offers a host of significant findings, which support the concept of resilience being an independent paradigm.\textsuperscript{24} Such findings help establish the idea that genetic and environmental factors (i.e., early life stress, and chronic stress during adulthood) can produce a situation of enhanced vulnerability and a reduced resilience of the brain, which in turn leads to an unsuccessful aging of the brain.\textsuperscript{25} Individuals possess the capacity to learn to be resilient by developing protective mechanisms that prevent them from the maladaptive effects of stress.\textsuperscript{25} Other studies have shown that resilience is associated with increased connectivity between the ventral and dorsal prefrontal cortex.\textsuperscript{26,27} thus, resilience has biological underpinnings, familial predisposition, and clear protective pathways against a number of life events. A number of other abnormalities in the brain have also been observed, for example, changes in neurocircuitry mediating reward, and activation and regulation of mesolimbic dopaminergic projections from the ventral tegmental area to the nucleus accumbens.\textsuperscript{28} It is not clear whether resilience is a modifiable or nonmodifiable factor. Studies report that resilience is affected by pharmacological interventions, e.g., antidepressant drugs; such findings open a new areas of treatment to mental disorder.\textsuperscript{29}

**RESILIENCE IN THE CONTEXT OF PSYCHIATRIC DISORDERS**

Survival against trauma is a unique characteristic to every human being. It has been established above that there is a strong interplay between resilience and mental illness.\textsuperscript{30} There is some evidence that resilience is lower among people who develop mental disorder, and high level of resilience may prevent the development of an illness or minimize the severity of illness. The number of traumatic events significantly decreases the level of resilience, and people are more likely to develop psychiatric disorders such as depression and suicide.\textsuperscript{32} The pathways to resilience for positive outcome are multidimensional and typically require complex multivariate modeling.\textsuperscript{33} This means that in order to fully grasp the effect of resilience, one would have to study multiple variables of the mental illness and the patient’s characteristics. This is important because people with an experience of trauma significantly differ, from those who have not had such experiences, in terms of structural as well as functional changes in the brain. Investigating mechanisms by which trauma is associated with increased risk of mental illness would provide insight into the processes involved in the emergence of mental disorders, as well as help with the identification and development of treatment for predisposed individuals.\textsuperscript{34} Resilience helps to minimize the extent of pathogenesis in developmental process or transition from health to disease, or wellness or illness by facilitating or arresting conversion to illness.

Researchers have investigated the association of resilience in euthymic patients with bipolar disorder. Their study illustrated that high levels of resilience were shown to be related to low levels of impulsivity and depressive episodes.\textsuperscript{35} The reciprocal relationship between resilience and impulsivity illustrates that it is important to enhance resilience in order to maintain mental stability in patients. A similar relationship was found in patients that had posttraumatic stress disorder (PTSD), where high levels of resilience correlated to low levels of PTSD.\textsuperscript{36} Resilience has even been shown to play a mitigating role in the ideation of suicide in depressive and anxious individuals. Studies show that resilience potentially moderates the risk of depression and anxiety symptoms on suicidal patients with depression and/or anxiety disorders.\textsuperscript{37} Results pertaining to these studies certainly support the idea that resilience has an important relationship to mental illness and have the potential to be used as a defensive measure toward specific mental health conditions such as depression and anxiety. Studies regarding ultra-high-risk (UHR) show that psychosocial functioning in UHR participants is often compromised, and this dysfunction is often associated with negative symptoms, adaptive coping, and resilience.\textsuperscript{37} Interestingly baseline resilience is found to be lower among those in the UHR group who converted to frank psychosis, compared those who did not. Treatment strategies for individuals at UHR for psychosis should be comprehensive, promoting resilience while targeting the reduction of positive and negative symptoms in order to foster social reintegration and recovery.

The notion of enhancing resilience through intervention has been studied with patients that had lived through a high
trauma situation. Studies to determine the effectiveness of “resilience-enhancing from for youth” in Russian federation have been conducted. The study offered combined recreational sport and psychosocial rehabilitation for 94 participants who were taken hostage in the 2004 school tragedy. The results indicated that significant intraparticipant mean increase in resilience at follow-up assessment, and greater self-reported improvement in resilience processes for participants who experienced more traumatic events. Therefore, resilience can be modified and enhanced by metallization and cognitive training. Other researchers have examined the effect of mindfulness training on resilience mechanisms in active-duty marines preparing for deployment. The mindfulness training condition was delivered in the form of 8 weeks of Mindfulness-based Mind Fitness Training (MMFT), which comprised 20 h of the classroom instruction plus daily homework exercises. MMFT emphasizes interpretive awareness, attention control, and tolerance of present-moment experiences. The main outcome measures were heart rate, breathing rate, plasma neuropeptide Y concentration, score on the response to stressful experiences scale, and brain activation as measured by functional magnetic resonance imaging. The results showed that mechanisms related to stress recovery could be modified in healthy individuals prior to stress exposure. These results carry important implications for evidence-based mental health research and treatment. As models of resilience inevitably reflect interpersonal variability, this approach is likely to provide valuable information for personalized medicine, where treatment is customized to individual patients. Furthermore, this could mean a new mouse model of resilience in schizophrenia research may emerge resulting from efforts to further explore pathophysiology. The resilience models offer a novel and more direct approach to drug discovery for schizophrenia and neuropsychiatric disorders.

**CLINICAL IMPLICATIONS OF RESILIENCE**

Treatment programs that utilize resilience require a dynamic partnership across health and nonhealth sectors. Psychiatrists and other mental health professionals should collaborate with policy-makers in developing policies and interventions to bolster resilience. Clinical and public health interventions each have a role in improving the chances of resilience in children and adults affected by severe adversity. Such interventions, which span across many lifespans, include support for parents of infants, early childhood intervention programs, school-based interventions, workplace/unemployment programs, and activity programs for older adults. Clinical implications induce renewed emphasis on the value of a clinician taking a good history, a strong therapeutic alliance, and the reinforcement of attitudes and behaviors known to facilitate resilient outcomes. The evidence suggests that resiliency is intertwined into processes involved in individual's response to adverse life events, which leads to psychopathology. Resiliency may be a fundamental characteristic just like other psychological constructs. However, it remains far too complex to simply determine the nature and degree of the resilience response in the face of an adverse situation. Due to this complexity, the problem that arises is the ambiguity in the term “resilience,” and this has caused a major setback for research that attempts to show a relationship between resilience and mental health. The ambiguities of resilience stem from the definition and the terminology at the patient level. Without a uniform understanding of resilience, it becomes hard to study the effectiveness of resilience as a treatment. However, some scientists have compounded a novel conceptualization of resilience, and this allowed other studies on resilience to be looked at through a more representative lens. They have examined the current conceptualizations of resilience as well as their own subdivisions and approaches to resilience in relation to mental health. These researchers sought to recognize that resilience can and has been defined on an individual level as well as on a group level. This may suggest that resilience can refer to the individual's ability to cope with stress and adapt to change on their own, but it can also be referred to as one's ability to look for help when they need it through interventions and stress groups. Conflict between these two definitions has led in the inability to utilize resilience as a theoretical concept in research. Others emphasize the dynamic meaning to “resilience” and thus, allows for the term to be divided on a multi-level basis. With a strong definition of resilience set in place, the relationship between mental health and resilience can be confirmed and approaches that use resilience to counteract mental illness can be considered. Some authors have looked at three resilience approaches that can be effective at preventing and counteracting mental illness. The first is the harm-reduction approach, which describes resilience in terms of a quick recovery after a time of stress, and this may include biological reasons and genetic predispositions. The next is the protection approach, in which an individual uses certain mechanisms or measures to maintain mental health (i.e., family, school, and friends). Finally, the promotion approach which describes the individual as one who promptly uses resources to aid in mental health. In order to utilize resilience as a counteractive measure, some of the approaches derived by these researchers can be manipulated (i.e., those who are suffering from mental illness can receive a sense of resilience through interventions). The notion of enhancing resilience through intervention has been studied with patients that lived through a high trauma situation. Resilience programs can also be developed in order to increase effectiveness of a treatment and improve outcome of the treatment process. In this, respect and intervention can increase resilience and as such, high resilience can
enlarge effectiveness of a treatment. This has a strong clinical implication for physical disorder as well as mental disorders, especially in how the treatment is developed and delivered.[90] One example of this is patients who undergo major surgery do not experience severe distress when they are resilient, and they also have a better recovery. Patients with chronic pain suffer less distress and face it with optimism when they are resilient. Therefore, one can make the argument that if resilience is encouraged throughout the treatment process, the treatment itself will become more streamline and manageable and in all probability lead to more favorable outcomes. Similarly, resilience plays an important role in the overall well-being of individuals.[51] Some resilience researchers believe that personal resilience is significant for responding to workplace and adult adversity,[52] and when someone experiences childhood adversity, they seem to demonstrate a certain level of posttraumatic growth. If introduced into nursing curricula, emotional intelligence interventions may increase coping resources and enhance social skills for nurses, which may be of benefit for their long-term occupational health. Studies have concluded that moderate resilience and emotional intelligence can help, nursing students, in this case, in coping with adversity in their future clinical work.[39] However, in the presence of severe trauma, the level of resilience may not have a very influential role. In a study of Palestinian school children, it has been reported that the intervention was not statistically significant, and it did not increase the level of resilience. The effect of the intervention was moderated by maternal attachment responses and/or family atmosphere.[54] Therefore, it must be noted that the level of adversity which creates a beneficial level of posttraumatic is rather finite and can have server unwanted consequences if the adversity present exceeds some unspecified threshold.

A clear role of resilience in psychopathology is not yet known; however, some isolated characteristics can be amalgamated to clarify how it plays a role in functioning as a protective factor. Some examples of this include maintaining a psychological state which provides protection against adversities in both acute and chronic conditions, minimizing the extent of pathogenesis in developmental process of transition from health to disease, facilitating return to original stage once the adverse situation has changed, and resiliency is modifiable.[39] Other psychological defense mechanisms allow individuals to deal with various changes and facilitate the process of healthy psychological development and development of personality. Individuals with high resilience have the capacity to “bounce back” after experiencing traumatic event, and/or the ability to recover from difficulties/changes.[39] Resilience can be developed into the focal point of many treatments to achieve many desired outcomes. Resilience programs have the potential have great benefit, and not only to people suffering from mental disorders but also to the general public by enhancing their ability to cope with unforeseen challenges.

**CONCLUSIONS**

To argue that it is an independent psychopathology, we need realistic evidence of epidemiological validity which may suggest that it exists in the community. It can delineate specifically to the group of people who have significantly more resilience, and further epidemiological finding is expected to provide information about validity of the concept of resilience and its correlation with mental disorders. Resilience is not a dichotomous concept but a parametric one. Further, it is clear that it is involved in prevention of progression of a psychopathology, like conversion to frank psychotic state from UHR state.

Though it is not clear, whether resilience is a modifiable or nonmodifiable factor, studies report that resilience is affected by pharmacological interventions, e.g., antidepressant drugs; such findings open newer areas of treatment of mental disorder. Understanding the psychology and neurobiology, underlying resilience will help develop strategies aimed at preventing psychopathology after exposure to severe adversity. However, individual differences exist, which determine the nature of psychopathology, response to treatment and outcome. Reason for such differences is complex which has been hampering the efforts to obtain best possible quality of life despite similar treatments and treatment settings.

We believe that it has been neglected factor while discussing psychopathology.

With increasing evidence for its involvement, a newer way of understanding psychopathology, protection of risk, and prevention of mental disorder is likely to emerge.

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**REFERENCES**

1. Norris FH, Tracy M, Galea S. Looking for resilience: Understanding the longitudinal trajectories of responses to stress. Soc Sci Med 2009;68:2190-8.
2. Bonanno GA. Loss, trauma, and human resilience: Have we underestimated the human capacity to thrive after extremely aversive events? Am Psychol 2004;59:20-8.
3. Sarchiapone M, Carli V, Janiri L, Marchetti M, Cesaro C, Roy A. Family history of suicide and personality. Arch Suicide Res 2009;13:178-84.
4. Diehl M, Hay EL, Chiu H. Personal risk and resilience factors in the context of daily stress. Annu Rev Gerontol Geriatr 2012;32:251-74.
