

Exploring Neuropsychological Markers Of Resilience And Vulnerability In Individuals With A History Of Childhood Trauma

Running Title: Exploring Neuropsychological Markers'

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Abstract:

This research paper delves into the cognitive and emotional dimensions of resilience and vulnerability in individuals who have experienced childhood trauma. Through a battery of psychological assessments, we examined the neuropsychological markers that distinguish those who display resilience from those who exhibit vulnerability in the aftermath of childhood trauma. Our study, involving 300 participants with confirmed histories of childhood trauma, sought to elucidate the specific cognitive and emotional factors that shape the diverse outcomes experienced by trauma survivors.

The results unveiled intriguing patterns within the realm of cognitive functioning, revealing that individuals with enhanced verbal comprehension and working memory capacities exhibited greater resilience. In contrast, vulnerability was associated with lower scores in perceptual reasoning and processing speed. Similarly, our investigation of memory function unveiled that those with superior verbal memory and learning abilities were more likely to exhibit resilience, showcasing their enhanced capacity for word recall and recognition.

Emotional processing emerged as a pivotal factor in understanding resilience and vulnerability. Individuals with fewer depressive symptoms and lower trait anxiety, as indicated by their scores on the Beck Depression Inventory-II and State-Trait Anxiety Inventory, were more likely to exhibit resilience. Conversely, those with elevated scores on these measures were at greater risk of vulnerability to the enduring effects of childhood trauma.

These findings emphasize the intricate interplay between cognitive and emotional factors in shaping outcomes for childhood trauma survivors. They underscore the importance of cognitive flexibility, adaptive problem-solving, and emotional regulation skills as potential protective factors against the adverse impact of trauma. Importantly, these insights have significant implications for the development of targeted therapeutic interventions and support systems tailored to enhance cognitive and emotional resilience in individuals with a history of childhood trauma.

While our study offers valuable insights into psychological markers of resilience and vulnerability, we acknowledge that a comprehensive understanding of this complex phenomenon necessitates integration with neuroimaging and psychosocial measures. Such interdisciplinary research endeavors hold the promise of advancing the development of personalized interventions to ameliorate the well-being of trauma survivors, providing them with the tools necessary to embark on a path towards recovery and resilience.

Keywords: Childhood Trauma, Neuropsychological Markers, Resilience, Vulnerability, Psychological Assessments, Cognitive Functioning, Memory Function, Emotional Processing

Introduction:

Childhood trauma, characterized by exposure to adverse experiences or events during formative years, represents a pressing public health concern with profound implications for psychological and neurological well-being throughout the lifespan. The consequences of such early-life adversity are multifaceted, affecting cognitive, emotional, and behavioral domains, often leading to significant long-term psychological distress (Gilbert et al., 2010; McLaughlin et al., 2019). Yet, the diversity of outcomes among trauma survivors has intrigued researchers, prompting inquiries into factors that distinguish those who exhibit resilience from those who display vulnerability (Masten, 2001; Rutter, 2012).

Neuropsychological research has been instrumental in elucidating the underlying mechanisms that contribute to differential outcomes in individuals who have experienced childhood trauma. The complexity of this phenomenon necessitates a multifaceted approach that incorporates cognitive, emotional, and neural perspectives (Teicher et al., 2016; Van Der Kolk, 2017). This study aims to contribute to the growing body of literature on this subject by investigating the neuropsychological markers that underlie resilience and vulnerability among trauma survivors.

Background and Significance:

Childhood trauma encompasses a spectrum of experiences, including physical, emotional, or sexual abuse, neglect, and household dysfunction (Felitti et al., 1998). Research has consistently demonstrated the association between childhood trauma and a range of negative outcomes, including an increased risk of psychiatric disorders (e.g., depression, anxiety, post-traumatic stress disorder) (Kessler et al., 2010; Teicher et al., 2003), cognitive deficits (e.g., impaired executive function, memory) (Anda et al., 2006; Teicher et al., 2012), and alterations in brain structure and function (Herrington et al., 2013; Teicher et al., 2016).

However, not all individuals who experience childhood trauma develop adverse outcomes. Resilience, defined as the ability to adapt positively in the face of adversity (Masten, 2001), emerges as a pivotal construct. Resilient individuals demonstrate remarkable adaptive capacities that enable them to cope effectively with the challenges posed by early-life trauma, often thriving despite their adverse experiences (Bonanno, 2004; Rutter, 2012).

Conversely, others exhibit vulnerability, experiencing enduring emotional distress and cognitive impairments in the aftermath of trauma exposure (Koenen et al., 2003; McLaughlin et al., 2010). This variability in outcomes underscores the importance of exploring the neuropsychological underpinnings of resilience and vulnerability, as understanding these markers may hold the key to informing targeted interventions and support systems for trauma survivors.

Statement of the Research Problem:

Despite substantial progress in understanding the adverse effects of childhood trauma, the specific neuropsychological markers that differentiate resilient individuals from those vulnerable to the long-term effects of such trauma remain a subject of inquiry. Existing research has illuminated some aspects of this complex interplay, but gaps persist, necessitating further exploration (McCrory et al., 2011; Teicher et al., 2016).

This study addresses the following research questions: What are the specific neuropsychological markers that differentiate resilient individuals from those vulnerable to the long-term effects of childhood trauma? How do cognitive functioning, memory processes, and emotional regulation contribute to these markers? By systematically investigating these questions, we aim to provide a more comprehensive understanding of the neuropsychological factors that influence outcomes in individuals with a history of childhood trauma.

Objectives:

- To identify and elucidate the neuropsychological markers associated with resilience and vulnerability in individuals who have experienced childhood trauma. Specifically, we aim to:
- Examine the cognitive functioning of trauma survivors, focusing on executive function, memory, and perceptual reasoning, to determine which aspects are associated with resilience or vulnerability.
- Investigate the memory processes of participants, particularly verbal memory and learning abilities, to identify whether superior memory function is a marker of resilience.
- Analyse emotional processing and regulation through self-report measures of depressive symptoms and trait anxiety, exploring how these factors contribute to resilience or vulnerability.

Hypothesis:

Cognitive Functioning Hypotheses:

Hypothesis 1a: Individuals who have experienced childhood trauma and exhibit enhanced scores in verbal comprehension and working memory on the Wechsler Adult Intelligence Scale (WAIS-IV) will demonstrate greater resilience to the long-term effects of trauma.

Hypothesis 1b: Lower scores in perceptual reasoning and processing speed on the WAIS-IV will be associated with vulnerability to adverse outcomes among individuals with a history of childhood trauma.

Memory Function Hypothesis:

Hypothesis 2: Superior verbal memory and learning abilities, as assessed by the California Verbal Learning Test (CVLT), will serve as a marker of resilience among trauma survivors, indicating a higher capacity for word recall and recognition.

Emotional Processing Hypotheses:

Hypothesis 3a: Individuals with lower scores on the Beck Depression Inventory-II (BDI-II), indicative of fewer depressive symptoms, will exhibit greater resilience in the face of childhood trauma.

Hypothesis 3b: Lower trait anxiety, as measured by the State-Trait Anxiety Inventory (STAI), will be associated with increased resilience among trauma survivors.

General Hypothesis:

Hypothesis 4: The interplay between cognitive factors (cognitive functioning and memory processes) and emotional factors (depressive symptoms and trait anxiety) will significantly contribute to differentiating resilience from vulnerability among individuals with a history of childhood trauma.

Importance of Understanding Neuropsychological Markers:

The significance of this research lies in its potential to inform interventions and support systems tailored to the needs of trauma survivors. By identifying specific neuropsychological markers associated with resilience and vulnerability, clinicians and researchers can develop targeted therapeutic approaches to enhance the well-being and psychological recovery of individuals who have experienced childhood trauma. This understanding may also contribute to the prevention of long-term mental health consequences in vulnerable populations.

In summary, this study addresses a critical gap in the literature by examining the neuropsychological markers that differentiate resilient and vulnerable individuals with a history of childhood trauma. By employing a comprehensive approach that integrates cognitive, emotional, and neural perspectives, we aim to provide valuable insights that can improve the quality of life for trauma survivors and enhance our understanding of the complex interplay between childhood trauma and neuropsychological outcomes.

Research Question: What are the specific neuropsychological markers that differentiate resilient individuals from those vulnerable to the long-term effects of childhood trauma?

Description: This research topic delves into the complex interplay between childhood trauma and neuropsychological markers, aiming to identify factors that contribute to resilience or vulnerability in affected individuals. The study will involve comprehensive neuropsychological assessments, neuroimaging techniques, and psychosocial measures to investigate how specific cognitive, emotional, and neurobiological factors may influence the long-term outcomes of individuals who have experienced childhood trauma. Understanding these markers can potentially inform targeted interventions and therapies for those at risk of adverse outcomes, ultimately improving the well-being and mental health of trauma survivors.

Literature Review:

Childhood abuse and maltreatment represent severe traumatic experiences that exert enduring effects on individuals' neurocognitive and psychological well-being. This comprehensive literature review synthesizes and analyses recent empirical investigations to elucidate the intricate interplay between early-life adversity and neuropsychological outcomes, with a specific focus on the lasting consequences and potential neurocognitive markers associated with childhood abuse.

Bomyea, J., Simmons, A. N., Shenton, M. E., Coleman, M. J., Bouix, S., Rathi, Y., Pasternak, O., Coimbra, R., Shutter, L., George, M. S., Grant, G. A., Zafonte, R., McAllister, T. W., & Stein, M. B. (2020) investigated neurocognitive markers of childhood abuse in individuals with PTSD through the INTRuST Clinical Consortium. Their research represents a crucial contribution, revealing profound neurocognitive impairments in this population, thus emphasizing the persistent impact of early trauma on cognitive function. These findings underscore the significance of meticulous assessment and intervention strategies tailored to individuals with a history of childhood abuse and subsequent PTSD.

Adolescence is recognized as a critical period characterized by substantial brain development and restructuring. Brenhouse, H. C., & Andersen, S. (2011) offered invaluable insights into the developmental trajectories in both male and female adolescents, thereby advancing our understanding of the underlying neural changes during this pivotal phase of life. Their comprehensive analysis reinforces the importance of delineating the neurobiological underpinnings of adolescence, with implications for comprehending the neural consequences of early-life adversity.

The work of Cabrera, C. J., Torres, H., & Harcourt, S. (2020) constitutes a noteworthy exploration of the neurological and neuropsychological sequelae stemming from child maltreatment. Their study unveils a wide spectrum of cognitive impairments associated with early-life trauma, illuminating the need for holistic evaluation and tailored interventions to mitigate the cognitive deficits experienced by affected individuals.

Câmara-Costa, H., Viot, S., Francillette, L., Opatowski, M., Toure, H., Brugel, D., Laurent-Vannier, A., Meyer, P., Watier, L., Dellatolas, G., & Chevignard, M. (2021) conducted a longitudinal inquiry into memory functioning following severe childhood traumatic brain injury, elucidating the enduring cognitive challenges encountered by these individuals. This research underscores the imperative for the development and implementation of personalized interventions and support strategies for children who have suffered traumatic brain injuries during their formative years.

Leveraging advanced neuroimaging techniques, Dannlowski, U., Stuhrmann, A., Beutelmann, V., Zwanzger, P., Lenzen, T., Grotegerd, D., Domschke, K., Hohoff, C., Ohrmann, P., Bauer, J., Lindner, C., Postert, C., Konrad, C., Arolt, V., Heindel, W., Suslow, T., & Kugel, H. (2012a, 2012b) meticulously examined the long-term consequences of childhood maltreatment. Their pioneering work uncovered the existence of "limbic scars," manifested as structural and functional alterations within brain regions closely associated with emotion processing. This evidence-based revelation significantly advances our understanding of the enduring neurobiological ramifications of maltreatment.

Furthermore, Dumontheil, I. (2014) contributed to the literature by investigating the development of abstract thinking during childhood and adolescence, underscoring the pivotal role played by the rostralateral prefrontal cortex in the maturation of abstract cognitive abilities. This research enriches our comprehension of cognitive development and how early-life experiences may influence these processes.

Early-life stress has been shown to exert profound effects on the development of brain regions implicated in emotion processing. Fareri, D. S., & Tottenham, N. (2016) explored the repercussions of early-life stress on the amygdala and striatum, shedding light on the neural mechanisms that underpin emotional regulation and decision-making. This research enhances our understanding of the intricate relationships between early-life adversity and neural development. Gillanders, S., & Gillanders, D. (2014) introduced an acceptance and commitment therapy intervention tailored to individuals with a history of childhood trauma, signifying the potential of psychological interventions in ameliorating the adverse effects of early-life adversity. This contribution highlights the importance of evidence-based therapeutic approaches for trauma survivors. Mark, C., & Poltavski, D. (2023) utilized functional near-infrared spectroscopy to detect neurophysiological deficits in young adults with a history of child abuse, offering novel insights into the assessment of cognitive impairments in this population. Their work suggests that this advanced neuroimaging technique may serve as a sensitive marker for evaluating neuropsychological deficits associated with early-life trauma.

Moreover, Mathieu, J., Brunaud, L., Reibel, N., Moukah, D., Witkowski, P., Lighezzolo-Alnot, J., Quilliot, D., & Ziegler, O. (2022) established a link between low resilience in severe obesity and adverse childhood experiences, underscoring the significance of adopting a holistic approach to understanding and addressing the consequences of early-life trauma.

The comprehensive review by McCrory, E., De Brito, S. A., & Viding, E. (2010) represents a seminal contribution to the literature on the neurobiology and genetics of maltreatment and adversity. This foundational work elucidates the intricate interplay between genetic factors, brain function, and the experience of childhood trauma, thus advancing our comprehension of the complex neurobiological mechanisms at play.

Finally, McLaughlin, K. A., DeCross, S. N., Jovanovic, T., & Tottenham, N. (2019) embarked on an exploration of the mechanisms that link childhood adversity with psychopathology. Their investigation underscores the potential role of learning as an intervention target, offering promising avenues for interventions aimed at mitigating the negative sequelae of early-life trauma.

In conclusion, this comprehensive review of the literature underscores the profound and enduring impact of childhood abuse and maltreatment on neurocognitive functioning and psychological well-being. The collective findings from these studies provide valuable insights into the underlying mechanisms and potential directions for intervention and support for individuals with a history of childhood trauma. Furthermore, they emphasize the importance of continued research in this area to refine our understanding and enhance the effectiveness of interventions for those affected by early-life adversity.

Methodology:

Participants: The study involved 300 participants (150 males, 150 females) aged 18-60 years, all of whom had experienced childhood trauma, as confirmed by standardized assessments.

Psychological Assessments: Participants underwent a battery of psychological assessments to evaluate various cognitive and emotional domains.

Cognitive Functioning: The Wechsler Adult Intelligence Scale (WAIS-IV) was administered to assess participants' cognitive abilities, including verbal comprehension, perceptual reasoning, working memory, and processing speed.

Memory Function: The California Verbal Learning Test (CVLT) was employed to evaluate verbal memory and learning abilities. Participants were asked to recall and recognize words from a previously presented list.

Emotional Processing: The Beck Depression Inventory-II (BDI-II) and the State-Trait Anxiety Inventory (STAI) were used to measure the participants' current levels of depressive symptoms and trait anxiety, respectively.

Procedure: Participants were recruited from community organizations and mental health clinics. After informed consent, they completed the psychological assessments in a controlled and standardized testing environment. The order of assessment administration was counterbalanced to minimize order effects.

Data Analysis: Data from the psychological assessments were subjected to various statistical analyses, including descriptive statistics, correlation analyses, and multiple regression. These analyses aimed to identify significant relationships between psychological assessment scores and resilience or vulnerability to childhood trauma outcomes.

Results:

Cognitive Functioning: The analysis of cognitive functioning revealed intriguing patterns among the participants. Individuals who exhibited higher scores in verbal comprehension and working memory on the WAIS-IV tended to display greater resilience in the face of childhood trauma. On the other hand, lower scores in perceptual reasoning and processing speed were associated with vulnerability to adverse outcomes.

Memory Function: The results from the CVLT indicated that individuals who demonstrated superior verbal memory and learning abilities were more likely to be resilient. They exhibited a higher capacity to recall and recognize words from the previously presented list compared to vulnerable individuals.

Emotional Processing: In terms of emotional processing, participants with lower scores on the BDI-II and STAI, indicating fewer depressive symptoms and lower trait anxiety, were more likely to exhibit resilience. Conversely, those with higher scores on these measures were at greater risk of vulnerability to the long-term effects of childhood trauma.

Discussion:

The results of our comprehensive psychological assessments shed light on the intricate interplay between cognitive and emotional factors in delineating resilience from vulnerability among individuals with a history of childhood trauma. Notably, cognitive dimensions such as verbal comprehension, working memory, and perceptual reasoning have emerged as pivotal determinants of resilience. This implies that the ability to adaptively process and comprehend information, along with flexible problem-solving skills, plays a crucial role in shielding individuals from the enduring repercussions of traumatic experiences.

Furthermore, our findings underscore the profound significance of emotional processing in the context of trauma outcomes. Lower levels of depressive symptoms and reduced trait anxiety were strongly associated with resilience. This highlights the pivotal role of emotional regulation and overall psychological well-being in mitigating the impact of childhood trauma. It underscores the importance of equipping individuals with effective emotional coping strategies.

The implications of these findings for therapeutic interventions and support systems are profound. Tailored interventions aimed at enhancing cognitive capacities, consolidating memory function, and fostering emotional regulation skills hold the promise of significantly improving the well-being of individuals who are susceptible to the long-term effects of childhood trauma. These interventions can empower survivors to develop a resilient mindset and effectively navigate the challenges posed by their traumatic experiences.

Nonetheless, it is essential to acknowledge that psychological assessments offer just one facet of the complex puzzle. To gain a more holistic understanding of the neuropsychological markers that contribute to resilience and vulnerability among childhood trauma survivors, future research should endeavor to integrate these findings with neuroimaging and psychosocial measures. This interdisciplinary approach will enable the development of even more precise and personalized interventions, ultimately enhancing the quality of life and prospects for recovery among trauma survivors.

Conclusion

This research has delved into the complex landscape of neuropsychological markers that differentiate resilience from vulnerability in individuals with a history of childhood trauma. Our findings, drawn from a comprehensive battery of psychological assessments, illuminate the intricate interplay between cognitive and emotional factors in shaping outcomes for trauma survivors.

One of the key revelations of this study is the pivotal role of cognitive functioning. Individuals with enhanced verbal comprehension and working memory capacities demonstrated greater resilience, suggesting that cognitive flexibility and adaptive problem-solving skills act as protective factors against the enduring effects of trauma. On the other hand, vulnerability was associated with lower scores in perceptual reasoning and processing speed, highlighting the significance of information processing abilities in determining outcomes.

Memory function emerged as another critical factor, with superior verbal memory and learning abilities serving as a marker of resilience. These individuals exhibited a heightened capacity for word recall and recognition, underscoring the importance of memory consolidation in coping with childhood trauma.

Emotional processing played a central role, as well. Those with fewer depressive symptoms and lower trait anxiety were more likely to exhibit resilience, emphasizing the importance of emotional regulation and psychological well-being in buffering the impact of trauma.

The implications of these findings are profound. They point to the need for targeted therapeutic interventions and support systems tailored to enhance cognitive and emotional resilience in individuals with a history of childhood trauma. By focusing on cognitive enhancement, memory consolidation, and emotional regulation skills, we have the potential to significantly improve the well-being and mental health of trauma survivors.

However, it's important to recognize that this study represents just one facet of a complex phenomenon. A comprehensive understanding of neuropsychological markers of resilience and vulnerability necessitates integration with neuroimaging and psychosocial measures. Interdisciplinary research endeavors hold the promise of advancing the development of personalized interventions to ameliorate the well-being of trauma survivors, providing them with the tools necessary to embark on a path towards recovery and resilience.

In summary, this research contributes valuable insights to the field of childhood trauma and neuropsychology. It highlights the multifaceted nature of resilience and vulnerability, emphasizing the interplay between cognitive and emotional factors. With these findings in mind, we are better equipped to design interventions that address the specific needs of trauma survivors, ultimately offering them a brighter and more hopeful future.

Recommendations for Practice:

In light of the research findings, several key recommendations can be made for practitioners and professionals working with individuals who have experienced childhood trauma. Firstly, early intervention and comprehensive assessments should be prioritized to identify cognitive strengths and weaknesses, as well as emotional well-being, thus guiding personalized treatment plans. Secondly, practitioners should consider the development and implementation of tailored cognitive enhancement programs focusing on specific cognitive domains such as verbal comprehension, working memory, and perceptual reasoning to foster adaptive problem-solving skills and cognitive flexibility. Thirdly, memory consolidation strategies, as highlighted in the research, should be integrated into therapeutic interventions to enhance verbal memory and learning abilities, improving recall and recognition. Additionally, practitioners should offer training in emotional regulation techniques, considering the importance of lower depressive symptoms and trait anxiety in resilience. Trauma-informed care, cultural competence, and interdisciplinary collaboration should also be emphasized, while continued monitoring and evaluation of individuals' progress, public awareness campaigns, and policy advocacy are essential to provide holistic support and enhance the well-being of trauma survivors. Lastly, further research in the field is encouraged to advance evidence-based practices and interventions for this population.

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