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Educational Implications: Physiological Changes in Eye Movement Desensitization And Reprocessing Treatment For Post-Traumatic Stress Disorder

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Abstract

Objectives: The purpose of this paper is to: 1) to critically examine the existing literature on the physiological mechanisms underlying Eye Movement Desensitization and Reprocessing (EMDR) therapy, 2) to highlight the necessity for future research on the mechanisms of EMDR in children and adolescents, especially in treating complex post-traumatic stress disorder (PTSD), and 3) to identify gaps in knowledge and emphasize the implications for educators and educational practices. Methods: A literature review using PubMed, PsychINFO, ERIC, and others was used to examine the results of neuroimaging investigations tracking volumetric changes, studies analyzing shifts in relative brain activity across different regions, and electroencephalographical (EEG) studies examining alterations in brain function. Results: The existing literature provides insights for educators into the prevalence of PTSD, the foundational premises of EMDR, the potential impact of EMDR in educational settings. Discussion: The discussion highlights the underlying neurological mechanisms and underscores the importance of utilizing EEG research to unlock further insights into EMDR for educators. Additionally, ten implications for educators and educational practices are outlined.

INTRODUCTION

As educators and mental health professionals delve into the complexities of trauma, its physiological effects, and its impact on students' educational journeys, pressing questions arise about how best to support this vulnerable population. In this exploration, Eye Movement Desensitization and Reprocessing (EMDR) therapy emerges as a promising intervention. EMDR, an evidence-based psychotherapy for post-traumatic stress disorder (PTSD) and trauma-related conditions, offers potential relief to those in need (Shapiro, 1995/2017). While educators may not administer EMDR therapy directly, grasping trauma-informed concepts, including the physiological responses associated with EMDR, can significantly enhance their ability to support students undergoing such treatment (Herrenkohl et al., 2019; Chafouleas et al., 2016; SAMHSA, 2014).

This article explores the intersection of psychology, neurobiology, and education, investigating how physiological changes following EMDR treatment for PTSD resonate within educational settings. Such an inquiry demands a multidisciplinary approach, urging us to transcend conventional disciplinary boundaries and collaborate to understand the holistic implications of EMDR. The significance of this manuscript lies in its recognition of the intricate interplay between trauma, its physiological manifestations, and students' educational experiences. As educators and mental health professionals strive to effectively support traumatized students, EMDR therapy emerges as a beacon of hope. Equipping educators with a foundational understanding of trauma-informed principles, including the physiological responses associated with EMDR, can significantly enhance their ability to provide meaningful support to students undergoing such therapy.

Through a synthesis of empirical research, clinical insights, and pedagogical considerations, this article aims to deepen our understanding of EMDR and its potential systemic impact. By bridging these disciplines, fostering dialogue among professionals, and empowering educators and mental health practitioners with the necessary knowledge, this study aims to facilitate the creation of transformative educational experiences. This interdisciplinary approach contributes to ongoing discussions surrounding trauma-informed educational practices, ultimately leading to more effective support systems for traumatized students.

METHODS

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The methodology for this study involved a comprehensive literature review combined with an integrative analysis to explore the physiological mechanisms underlying Eye Movement Desensitization and Reprocessing (EMDR) therapy and its implications for educational practices. Initially, a systematic search of academic databases such as PubMed, PsycINFO, and ERIC was conducted to identify relevant studies on EMDR therapy, neurobiological changes, and educational outcomes using keywords like "EMDR," "neurobiological," "neuroimaging," "EEG," "brain activity," "PTSD," "children and adolescents," and "educational practices." Titles and abstracts were screened to select studies that met inclusion criteria, focusing on peer-reviewed articles, clinical trials, and meta-analyses. Data on study design, population, methods, key findings, and conclusions were extracted and categorized into thematic areas, including neuroimaging results, EEG studies, and educational implications.

The researchers also examined how neurobiological insights from EMDR research could inform trauma-informed educational practices, identifying gaps in current knowledge and proposing areas for future research, especially in educational contexts. Experts from counseling, psychology, and education were engaged to provide insights and validate the findings, fostering interdisciplinary dialogue to refine the understanding of EMDR's impact and practical applications in educational settings.

RESULTS

The literature review revealed several key insights into the physiological mechanisms underlying Eye Movement Desensitization and Reprocessing (EMDR) therapy and its implications for educational practices. A search for EMDR AND (EEG OR ELECTROENCEPHALOGRAPHY) yielded 70 results, which were reduced to 49 when filtered to include only peer-reviewed articles. From this list, four articles were chosen based on recency and relevance to the research question. A search for EMDR AND “VOLUMETRIC CHANGES” yielded 6 results, of which 5 were retained after applying the peer review filter, and only one was retained when filtering for articles since 2010. A search for EMDR AND (NEUROBIOLOGICAL OR NEUROPHYSIOLOGICAL) yielded 154 results, which was reduced to 82 peer-reviewed articles and 77 that were published since 2010. Four were directly chosen. The references section of the articles chosen was used to select the remainder of the articles. This was a data-saturation approach in which the search for more articles continued until the information became repetitive. The systematic search and analysis of studies provided a comprehensive understanding of the neurobiological changes associated with successful EMDR treatment. This section will offer the results with an emphasis on providing an educator’s guide to PTSD and EMDR, along with an exploration of neurological mechanisms and their insights for educators.

Educators' Guide to PTSD & EMDR: Understanding Their Nature and Origins

PTSD is a condition triggered by exposure to psychosocial stressors (American Psychiatric Association, 2022). This condition can be profoundly challenging and debilitating as it impacts an individual, causing stress in daily activities, which may include educational endeavors. Understanding trauma’s relentless impact on the mind and body is essential as it forms the backdrop against which EMDR therapy's physiological transformations unfold.

Prevalence of PTSD

Since inclusion in the DSM-III in 1980, the landscape of PTSD diagnosis and treatment has undergone continuous evolution and debate. The original understanding of the diagnosis included "shell shock" and "combat fatigue" based on World War I and II, which has since evolved into characterized by symptoms such as intrusive thoughts, flashbacks, nightmares, hypervigilance, avoidance of trauma-related stimuli, negative mood and cognition, and alterations in arousal and reactivity. Importantly, the evolution of PTSD recognizes that the psychological impact of trauma is not solely due to the physical effects of combat but involves complex psychological processes (American Psychiatric Association, 2022).

Nevertheless, surprising statistics have been available for over a decade. For instance, Kilpatrick and colleagues (2013) reported on a comprehensive study and revealed that 89.7% of Americans encountered an event qualifying as PTSD under the DSM-5 criteria. Furthermore, their research described the lifetime prevalence of PTSD in 9.4% of Americans (5.7% of men and 12.8% of women). The statistics underscore the prevalence of trauma experiences within our society, with potential implications for working with students in an educational setting.

In addition to this data on the overall pervasiveness of PTSD in the general population, specific research has explored the prevalence in school-aged populations. For instance, Bessel van der Kolk's (2005) pioneering work introduced a paradigm shift, emphasizing that trauma experienced during childhood, particularly from primary attachment figures, constitutes a distinct diagnostic entity, which differs from PTSD occurring in adulthood or resulting from specific stressors. Notably, only 18% of children who experience severe developmental trauma met the classic criteria for PTSD. This perspective illuminates the nuanced nature of childhood trauma experiences and underscores the importance of educators understanding the unique challenges these students may face.

Salazar and colleagues (2013) investigated older adolescents in the foster care system in another school-age population. They found that 80.3% had encountered a DSM-qualifying event, with 18.8% meeting the diagnostic criteria for PTSD. These findings emphasize the critical need for educators working with foster youth to be attuned to the possibility of trauma-related challenges affecting academic performance and well-being.

An additional consideration for educators is the dynamic nature of trauma. In a study, Bryant et al. discovered that up to 25% of individuals exposed to trauma developed delayed-onset PTSD, extending into adolescence. This delay in trauma exposure to symptom presentation underscores the importance of ongoing support and intervention for students who may not exhibit immediate trauma-related symptoms.

Moreover, educators should be aware of recent developments in trauma-related diagnoses, including Complex PTSD (C-PTSD) in the World Health Organization's (2019) International Statistical Classification of Diseases and Related Health Problems. Despite not being recognized in the DSM-5 (2013) by the American Psychiatric Association (APA), C-PTSD is a valid diagnosis, according to the WHO. Individuals grappling with trauma during the developmental period may exhibit symptoms beyond classic reexperiencing and heightened autonomic hyperarousal. They are also more likely to experience impaired relational abilities, negative self-concepts, prolonged dissociative states under emotional pressure, and engagement in reckless or self-destructive behavior (World Health Organization, 2019). Educators should consider these multifaceted effects when supporting students who have experienced trauma, fostering inclusive and trauma-informed learning environments.

Foundational Premises of EMDR

The foundational premises of EMDR are based upon bilateral stimulation, memory reconsolidation, reduction in distress, neurological mechanisms, and integration of traumatic memories. First, a core component of EMDR is bilateral stimulation, which typically involves back-and-forth eye movements. This bilateral stimulation is believed to activate both brain hemispheres, facilitating the processing of traumatic memories. Francine Shapiro, the founder of EMDR therapy, introduced the concept of bilateral stimulation. (Shapiro, 1995). Second, EMDR is based on the theory of memory reconsolidation, which posits that traumatic memories can be modified and reprocessed when recalled and associated with bilateral stimulation. This notion leads to a less emotional and distressing memory of the traumatic event. (van den Hout, et al., 2011). Third, during EMDR therapy, clients often report decreased emotional distress associated with traumatic memories. This result can manifest as reduced anxiety, fear, and other negative emotions. Neurobiological studies have shown that EMDR can change the emotional processing of traumatic memories. (Leeds, & Korn, 2000). Fourth, research suggests that EMDR may affect brain regions involved in emotion regulation, such as the amygdala and prefrontal cortex. These changes in brain activity are believed to reduce distress associated with traumatic memories. (Lanius, Bluhm, & Lanius, 2006). Lastly, EMDR therapy aims to help individuals integrate traumatic memories into their broader life narrative in a less emotionally charged way. It encourages cognitive and emotional processing of the trauma, leading to a more balanced perspective. (Bisson & Andrew 2007).

Further Illuminating the Power of EMDR in Education

In the context of education, it is paramount to acknowledge that EMDR has emerged as a substantiated and effective therapeutic intervention for PTSD. A wealth of research, including studies endorsed by the World Health Organization (2013), has consistently affirmed EMDR's prowess in mitigating the effects of PTSD. Remarkably, the burgeoning interest in EMDR therapy is reflected in the fact that more than 11,000 therapists have earned certification as EMDR therapists since the establishment of the EMDR International Association (EMDRIA), emphasizing its growing relevance in education.

However, educators should be acutely aware that the enigma of uncovering the underlying physiological mechanisms of EMDR remains. Researchers have harnessed diverse methodologies, including imaging studies to trace volumetric changes, functional studies to investigate shifts in brain reactivity, and quantitative electroencephalography (qEEG) to scrutinize brain-wave patterns resulting from EMDR treatment. This ongoing quest for understanding holds immense promise for educators, potentially ushering in a profound comprehension of how EMDR therapy impacts students who have experienced trauma. Ultimately, this insight may empower educators to provide more effective support and craft trauma-informed learning environments, furthering our collective commitment to student well-being and academic success.

EMDR is guided by the Adaptive Information Processing (AIP) model, wherein practitioners view symptoms as manifestations of networks containing maladaptively stored memories (Shapiro, 2017). These dysfunctionally stored memories can be triggered by current life events, resulting in maladaptive responses in the present (Leeds, 2016). Leeds (2016) posited that everyone possesses an innate information processing system capable of adaptively integrating the memories of distressing experiences into existing memory networks within the AIP model. Educators should grasp this foundational concept as it has implications for students who may have experienced trauma. Understanding the underpinnings of EMDR can facilitate a more empathetic and supportive approach to students undergoing this therapy.

In EMDR therapy, therapists guide clients in recalling distressing memories while helping them connect with the associated emotions, physical sensations, and negative cognitions related to the trauma (Shapiro, 2016). During this process, clinicians employ Alternating Bilateral Stimulation (ABS) through various means. Initially, this stimulation often involves back-and-forth, saccadic eye movements. After sets of 24 passes of ABS at 2 Hz, the therapist allows the client to breathe and inquire, "What do you get now?" Importantly, without delving into cognitive exploration, the therapist encourages the client to "go with that" and proceeds to the next set of ABS.

It is noteworthy that therapists may also ask clients to rate their Subjective Units of Distress (SUDs) on a scale from 0 to 10, a practice that can be particularly relevant in educational settings when working with students who may benefit from EMDR

therapy. The therapist installs a positive cognition once the client achieves a SUDs rating of 0 while recalling the memory. This treatment involves utilizing sets of 8-12 cycles of ABS at 0.5 Hz. Additionally, therapists may guide clients to visualize themselves remaining calm and effectively managing triggering situations in the future, again employing 8-12 sets of slow ABS.

Educators should be aware of EMDR therapy's underlying principles and techniques, as it may inform their approach to supporting students undergoing this treatment. By understanding the process and potential outcomes, educators can contribute to a more compassionate and informed educational environment for students dealing with trauma and its effects. Educators must also recognize the robust body of evidence supporting the effectiveness of EMDR therapy across diverse populations. Numerous studies have underscored EMDR's efficacy in addressing various conditions affecting children, adolescents, and adults. For instance, Wilson and colleagues (2018) highlighted EMDR's effectiveness in treating PTSD in adults, shedding light on its potential relevance in educational settings.

Furthermore, Beer (2018) emphasized EMDR's efficacy in treating children with PTSD, a finding of particular importance for educators working with young learners who may have experienced trauma. Additionally, research has illuminated EMDR's effectiveness in addressing various other conditions, including anxiety disorder (de Jongh & ten Broeke, 2009), addiction (Markus & Hornsveld, 2017), depression (Ostacoli et al., 2018), and adult attachment status (Wesselmann & Potter, 2009). Educators should be aware of these findings as they highlight the potential applicability of EMDR therapy in addressing a broad spectrum of emotional and psychological challenges students encounter.

Moreover, Korn (2009) explored EMDR's effectiveness in complex PTSD, which may manifest in students who have experienced prolonged and severe trauma. This research underscores the relevance of EMDR in addressing complex trauma that educators may encounter in their students. Notably, Pagani et al. (2012) conducted a study demonstrating that a relatively small number of EMDR sessions resulted in complete remission of PTSD symptoms, with enduring effects observed during a 2-year follow-up. This study underscores the potential for relatively brief EMDR interventions to yield substantial and lasting benefits, which can be particularly relevant for educators working within limited timeframes.

Carleto et al. (2019) presented findings on the effectiveness of EMDR in treating co-occurring PTSD and breast cancer, indicating its potential to alleviate PTSD symptoms even in challenging medical contexts. Educators should be aware of the potential cross-disciplinary applications of EMDR, as students may face trauma-related challenges in various aspects of their lives. Furthermore, research by Rousseau and colleagues (2021) highlighted how EMDR treatment can improve sleep patterns, which is particularly significant in educational contexts, as sleep quality can profoundly affect students' cognitive and emotional well-being.

Lastly, Bongaerts and colleagues (2017) studied the effectiveness of intensive EMDR treatment for patients diagnosed with Complex PTSD (C-PTSD) according to ICD-11 criteria. Their findings indicated substantial improvement and even a "loss of diagnosis" in some patients undergoing treatment. Educators should recognize that EMDR has the potential to address complex trauma-related challenges that may impact students' emotional and academic well-being. In summary, educators should be aware of the extensive evidence supporting the efficacy of EMDR therapy in addressing a wide array of conditions, as this knowledge can inform their approach to supporting students' emotional and psychological well-being.

The findings of this extensive literature review emphasize the substantial physiological transformations induced by Eye Movement Desensitization and Reprocessing (EMDR) therapy, shedding light on their relevance for educational strategies. Through the examination of neuroimaging and EEG investigations, a comprehensive comprehension emerges regarding how EMDR fosters therapeutic progress via neurobiological pathways, particularly within brain regions governing memory, emotional regulation, and cognitive management. Subsequently, the subsequent section will delve into these foundational neurological mechanisms, synthesizing EMDR-related insights, with a particular focus on EEG research, and offer ten implications pertinent to educators and educational methodologies.

Exploring Neurological Mechanisms: Insights for Educators

While EMDR therapy has been studied intensively for over two decades, educators must know that the exact mechanism of action remains a topic of ongoing investigation and debate. Shapiro's (1989) pioneering work introduced the hypothesis that EMDR makes neural networks containing inadequately processed traumatic material more pliable, facilitating their integration with adaptive memory networks (Shapiro, 1989). However, subsequent research has yielded multiple theories regarding the mechanisms underpinning EMDR's efficacy, emphasizing the complex nature of its effects (Yaggie et al., 2015; Bergman, 2010).

One notable aspect of this complexity relates to the amygdala's role in emotion regulation and its connection to EMDR therapy. Abnormal amygdala functioning is associated with heightened emotional reactions to perceived threats and difficulty returning to baseline emotion. Patients with PTSD often exhibit reduced amygdala volume (Rousseau et al., 2018), potentially explaining emotional regulation problems in this population. Interestingly, EMDR treatment has been linked to increases in amygdala volume, specifically noted in studies involving patients with PTSD (Laugharne et al., 2016). This finding is significant for educators as it suggests potential improvements in emotional regulation among students undergoing EMDR therapy.

Moreover, researchers have explored the theory that EMDR's mechanism of action involves interhemispheric coherence (Leeds, 2016). While some theories proposed a lack of interhemispheric cohesiveness as a contributor to trauma-related challenges, EEG studies have not consistently supported this idea (Yaggie et al., 2015). Instead, this research has suggested that

EMDR may enhance cohesiveness between regions rather than between hemispheres. Importantly, these findings are derived from studies involving individuals who did not meet DSM criteria for PTSD, underscoring the potential relevance of EMDR-related neurological changes for a broader student population.

The role of the fusiform gyrus in trauma processing is another aspect of EMDR's mechanism of action that educators should be aware of. Dysfunctional changes in this brain region have been associated with misperceptions of novel events as threatening in individuals with PTSD (Edmiston & Blackford, 2013; Kennis et al., 2016). EMDR has been postulated to restore activity in the right fusiform gyrus, potentially facilitating the processing of visual recollections and enabling a more rational view of trauma (Carleto et al., 2019). These insights emphasize the relevance of EMDR in addressing the visual perception and sensory integration challenges that students with trauma-related experiences may encounter.

Furthermore, EMDR has been linked to changes in emotional asymmetry, with the right hemisphere playing a significant role in emotional expression and perception (Pagani et al., 2012). Increased activity in the left cerebral hemisphere, facilitated by EMDR, may significantly reduce negative emotional experiences. This understanding can be particularly relevant for educators dealing with students struggling to regulate emotions.

The Rapid Eye Movement (REM) analog theory also posits that EMDR activates neural mechanisms associated with REM sleep, allowing dysfunctional traumatic memories to integrate into more adaptive memory networks (Stickgold, 2002; Rousseau et al., 2018). This hypothesis aligns with the observation that EMDR's eye movements resemble REM sleep. Educators should consider the potential connections between EMDR and improved emotional regulation and memory processing among students.

Finally, it is worth noting that EMDR involves the desensitization of troubling memories and the development of adaptive memory networks, often referred to as resourcing (Shapiro & Laliotis, 2017). While the importance of the therapeutic relationship and attunement in EMDR is recognized (Hase & Brisch, 2022), the neurological underpinnings of attunement require further research. Educators should remain informed about these ongoing developments to better support students who may undergo EMDR therapy. In conclusion, educators should be aware of the evolving understanding of EMDR's mechanism of action and its potential neurological effects. This knowledge can inform their approach to supporting students who have experienced trauma and may benefit from EMDR therapy, promoting a more empathetic and trauma-informed educational environment.

Unlocking EMDR Insights with EEG Research for Educators

Educators must recognize the unique advantages of electroencephalography (EEG) for measuring neurological activity, particularly in therapeutic response evaluation. Unlike other methods like positron emission tomography (PET) and functional magnetic resonance imaging (fMRI), EEG can detect changes in brain activity occurring within milliseconds. This remarkable temporal resolution, combined with EEG's increased portability, reduced patient discomfort, and cost-effectiveness, renders it a highly practical and applicable choice for researching therapeutic outcomes (Lobo et al., 2015).

However, it is essential to note that various researchers have employed different methodologies when conducting EEG studies with EMDR patients, resulting in challenges when comparing their findings (Pagani et al., 2012). Despite these challenges, EEG studies have illuminated significant shifts in brain activation patterns following successful EMDR treatment. Specifically, these studies have shown a transition from "limbic regions with high emotional valence to cortical regions with higher cognitive and associative valence" (Pagani et al., 2012, p. 17). Educators should understand the potential implications of these neural shifts for students undergoing EMDR therapy, particularly regarding improved emotional regulation and cognitive processing.

Harper et al. (2009) have provided valuable insights into the impact of EMDR on brain rhythms. Their research suggests that EMDR significantly enhances the power of a naturally occurring low-frequency rhythm in memory-related brain areas. This enhancement is believed to facilitate changes in traumatic memories, enabling their integration into the memory system without evoking the extreme emotions associated with the initial trauma. This hypothesis aligns with Shapiro's (2016) theory that memories are stored in various channels and Siegel's concept of "synaptic shadows" representing dysfunctional memories (pp. 14–15). Importantly, Harper and colleagues' qualitative electroencephalography (qEEG) findings support the idea that EMDR acts to depotentiate fear memory synapses in the amygdala during a brain state like slow-wave sleep, aligning with the REM analog hypothesis (Stickgold, 2008).

Additionally, educators should be aware of the specific requirements of EMDR protocols regarding ABS implementation, typically performed at approximately two Hz for effective desensitization of traumatic memories (Shapiro, 2017; Leeds, 2018). This understanding can help educators comprehend the therapeutic process and the potential neural changes that students undergoing EMDR may experience. In summary, educators should acknowledge the advantages of EEG in assessing therapeutic responses, appreciate the complexities of EEG research in the EMDR context, and understand the potential neural changes associated with EMDR therapy. This knowledge can contribute to a more informed and empathetic approach when working with students undergoing trauma-related treatment and may help create a more supportive educational environment.

Ten Implications to Educators and Education

Recognizing the physiological changes connected to EMDR treatment for PTSD holds significant importance for educators and the field of education for ten compelling reasons. First, educators are often the first line of defense when recognizing

students struggling with trauma or PTSD. Understanding the physiological changes linked to EMDR enables educators to connect the dots between behavioral or emotional changes in students and the potential effects of therapy. This awareness allows them to offer empathetic and targeted support, whether through individualized attention, referrals to school counselors, or involvement in a student's Individualized Education Plan (IEP) if applicable. Second, trauma-related triggers can disrupt a student's ability to focus and learn. Educators who understand bilateral stimulation and its potential benefits can contribute to a learning environment that minimizes triggers and supports students' emotional regulation. Third, educators can create trauma-informed learning environments. Trauma-informed education is an approach that emphasizes building safe, supportive, and nurturing learning environments. Knowledge of EMDR's impact on physiology can guide educators in implementing trauma-informed practices. They can adapt their teaching methods, classroom routines, and discipline strategies to be more sensitive to students' potential trauma triggers and emotional needs. This approach fosters a sense of safety and trust among students, making learning more effective.

Fourth, educators may notice changes in students' behavior, attention, or emotional regulation that could be related to trauma or PTSD. Knowing about the physiological changes associated with EMDR therapy allows them to consider these factors when addressing behavioral issues and seeking appropriate student support. Fifth, educators can collaborate with mental health professionals. Collaboration between educators and mental health professionals is crucial for addressing the complex needs of students with trauma or PTSD. Understanding the physiological changes associated with EMDR treatment helps educators engage in more productive discussions with mental health professionals. They can share observations, provide context for students' behaviors, and actively participate in creating comprehensive support plans. This collaboration ensures that students receive consistent holistic care for their mental health and academic progress. Sixth, EMDR therapy can positively impact students' emotional regulation and social interactions. Educators can leverage this knowledge to incorporate social and emotional learning (SEL) strategies into their curriculum, promoting students' emotional well-being and interpersonal skills. Seventh, knowledge about EMDR treatment and its physiological effects can contribute to reducing the stigma surrounding mental health in schools. Well-informed educators can educate their colleagues, students, parents, and guardians about seeking help. This effect fosters a more open and accepting school culture where students are encouraged to seek support without fear of judgment, ultimately benefiting their well-being and academic success.

Eighth, educators can tailor educational plans. Some students receiving EMDR therapy may require adjustments to their educational plans, such as accommodations for stress triggers or flexible scheduling. Educators aware of these needs can work with students and their support teams to create personalized learning strategies. Ninth, educators informed about EMDR therapy and its physiological effects are better equipped to participate in professional development related to trauma-informed education. This notion can enhance their ability to support students who have experienced trauma. Lastly, it can enhance academic success. Trauma and PTSD can significantly impact a student's ability to learn and succeed academically. By being informed about the physiological changes that may occur during EMDR treatment, educators can tailor their teaching methods to accommodate students' needs. For example, they can provide flexible deadlines, create a calm and predictable classroom environment, and offer additional emotional support during challenging academic tasks. These adjustments can help students better manage their stress and focus on their education, ultimately improving their academic outcomes.

Significance and Limitations

The findings of this research build upon previous studies on EMDR therapy by delving deeper into the neurobiological mechanisms underlying its efficacy. While Shapiro's (1989) initial work proposed that EMDR facilitates the integration of traumatic memories into adaptive networks, subsequent research, such as that by Yaggie et al. (2015) and Bergman (2010), has expanded on this hypothesis, revealing the complexity of EMDR's effects. One advantage of this research lies in its exploration of specific brain regions implicated in trauma processing, such as the amygdala and the fusiform gyrus. By investigating changes in these regions following EMDR therapy, researchers provide valuable insights into how EMDR may improve emotional regulation and visual perception among individuals with trauma-related experiences. Moreover, the consideration of interhemispheric coherence and emotional asymmetry offers a nuanced understanding of EMDR's neurological effects, potentially broadening its applicability beyond individuals with PTSD.

However, this field of research also has limitations. While studies have observed associations between EMDR therapy and changes in brain activity, causality cannot be inferred definitively. Additionally, the heterogeneity of trauma experiences and individual responses to EMDR therapy complicates the interpretation of findings. Furthermore, the reliance on neuroimaging techniques presents methodological challenges, such as the need to account for factors like medication use and comorbidities that may influence brain function.

In summary, while this research enhances our understanding of EMDR's mechanism of action and its neurological correlates, further studies are needed to elucidate the causal relationships and address methodological limitations. Educators should approach these findings with caution, recognizing the ongoing nature of research in this field, but they can still benefit from the insights provided to better support students undergoing EMDR therapy.

CONCLUSIONS

Recognizing that licensed mental health professionals typically provide EMDR therapy, educators play a pivotal role in supporting students by recognizing their needs, cultivating a safe and empathetic classroom environment, and facilitating access to appropriate mental health services when necessary. Integrating trauma-informed practices into education and fostering close collaboration with mental health professionals, particularly for students undergoing trauma-focused treatments like EMDR, is essential. With a deeper understanding of the physiological basis of EMDR, educators can approach student support with heightened empathy and insight, fostering a comprehensive and holistic approach to student care. These concerted efforts significantly contribute to students' well-being and academic success.

In conclusion, this discussion highlights the importance of utilizing EEG research to enhance educators' comprehension of the underlying neurological mechanisms of EMDR therapy. This knowledge equips educators with valuable insights as they assist students undergoing EMDR treatment or facing trauma-related challenges. Furthermore, the discussion delineates ten practical implications for educators and educational practices, furnishing clear guidance on integrating trauma-informed approaches into classrooms and fostering effective collaboration with mental health professionals to ensure the well-being and academic achievement of all students.

AUTHOR CONTRIBUTION STATEMENT

All authors agree to the final version of this article.

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