EMDR Treatment for Persistent Post-Concussion Symptoms Following Mild Traumatic Brain Injury: A Case Study

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The majority of people who experience mild traumatic brain injury (mTBI) have a healthy recovery, where initial somatic, cognitive, psychological, and behavioral mTBI-related symptoms resolve naturally within hours or days. Unfortunately, a significant minority of people develop persistent post-concussion symptoms, sometimes referred to as persistent post-concussion syndrome (pPCS), often causing severe long-term reduction in well-being and daily function. Psychological and neuropsychological treatments are typically limited to antidepressants, psychoeducation on mTBI and pPCS, basic neurorehabilitative cognitive compensatory strategies, traditional cognitive behavioral therapy, or no treatment at all. This paper discusses a single case study which demonstrates how eye movement desensitization and reprocessing (EMDR) therapy might provide psychological improvement in clients who sustain mTBI and develop pPCS. The case example describes a 57-year-old man who sustained a mTBI from a serious road traffic collision as a pedestrian and who developed pPCS. Treatment included nine 1.5-hour EMDR sessions across a 5-month period (the first being an assessment). Measures of psychological symptom change and client feedback were taken at pretreatment, midtreatment, posttreatment, and aftertreatment had ceased to gauge long-term status. Measures were taken at 18-month follow-up and 4-year review (which followed litigation settlement). The novel viability for the application of EMDR for this client group isdiscussed.

Keywords: brain injury; mild traumatic brain injury (mTBI); post concussion syndrome; post-concussion symptoms; eye movement desensitization and reprocessing (EMDR) therapy

An estimated 50 million people worldwide suffer a mild traumatic brain injury (mTBI) each year, and this figure is increasing (Maas et al., 2017). It is by far the most common of traumatic brain injuries (over 90% according to Steyerberg et al., 2019). Definitions of mTBI vary, but the American Congress of Rehabilitation Medicine (Kay et al., 1993), the World Health Organization (WHO) collaborating task force on mTBI (Carroll et al., 2004), *Lishman's Organic Psychiatry* (Fleminger, 2009), and the *Diagnostic and Statistical Manual of Mental Disorders*, *Fifth Edition* (American Psychiatric Association, 2013) all agree on the following: any loss of consciousness of 30 minutes or less; a Glasgow Coma Scale score of 13 to 15 after 30 minutes; posttraumatic amnesia of less than 24 hours.

Persistent Post-Concussion Syndrome/ Symptoms

Debate within the field of persistent post-concussion syndrome (pPCS) is polarized, with three areas in particular dividing opinion: diagnostic terminology, specificity, and prevalence. Firstly, *DSM-5* omits post-concussion syndrome (PCS) in favor of taking an individual symptoms-based approach. The International Classification of Diseases (11th edition), which dominates U.K. diagnosis, is likely to follow suit when it is published in 2022. Secondly, the main driver for the changes in diagnostic criteria center around base rate data demonstrating lack of specificity and similar symptom frequency to non-mTBI populations, including posttraumatic stress disorder

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(PTSD) populations (see Lagarde et al., 2014), Thirdly, methodological issues with population groups, diagnostic variability, and ambiguity have meant that the literature on prevalence is at loggerheads. Prevalence figures vary widely (between 11% and 82%), according to Polinder et al. (2018). However, a concise and comprehensive description still exists within the current International Classification of Diseases (10th edition):

> *The [postconcussion] syndrome occurs following head trauma (usually sufficiently severe to result in loss of consciousness) and includes a number of disparate symptoms such as headache, dizziness (usually lacking the features of true vertigo), fatigue, irritability, difficulty in concentrating and performing mental tasks, impairment of memory, insomnia, and reduced tolerance to stress, emotional excitement, or alcohol. These symptoms may be accompanied by feelings of depression or anxiety, resulting from some loss of self-esteem and fear of permanent brain damage. Such feelings enhance the original symptoms and a vicious circle results. Some patients become hypochondriacal, embark on a search for diagnosis and cure, and may adopt a permanent sick role. The aetiology of these symptoms is not always clear, and both organic and psychological factors have been proposed to account them. The nosological status of this condition is thus somewhat uncertain. There is little doubt, however, that this syndrome is common and distressing to the patient. At least three of the features described above should be present for a definite diagnosis. Careful evaluation with laboratory techniques (electroencephalography, brain stem evoked potentials, brain imaging, oculonystagmography) may yield objective evidence to substantiate the symptoms but results are often negative. The complaints are not necessarily associated with compensation motives.*
> (WHO, 1992; section F07.2)

Risk Factors

The risk of pPCS does not linearly correlate with early neurological severity of injury markers, however there is a stronger consensus in the literature on the risk factors for developing pPCS, including: complicated brain injury, repeated brain injury, female gender, increasing age, psychiatric history, or a history of chronic pain syndromes, additional physical injury, and mechanism of injury (Belanger et al., 2005; Dikmen et al., 2017; Fehily & Fitzgerald, 2017; Legarreta et al., 2018). Theoretical models of pPCS have postulated an organic precipitant and psychological perpetuation for a long time (see Lishman, 1988). Seminal revisions of this model include Wood's (2004) diathesis-stress and coping model. However, in 2011 Silverberg by way of a systematic review of the literature identified that physical and psychological factors play a role from the outset.

Current Treatments

Prompt psychoeducation treatment using cognitive-behavioral-informed concepts, focusing on management of fatigue and the emotional and physical symptoms of pPCS, is frequently cited as the most established treatment (Nygren-de Boussard et al., 2014; Wade et al., 1998). Similarly, Mittenberg et al. (1996) showed brief, manualized, and early cognitive behavioral therapy (CBT) interventions for pPCS reduced incidence of pPCS at blinded 6-month follow-up. In the United Kingdom, King's (2015) publication of a guided self-help for mTBI and pPCS provided an accessible treatment approach beyond the acute phase for both clients and psychological therapists without specialist knowledge of brain injury. Other variations to treatment include, cognitive rehabilitation, which shares some overlap with the CBT approach, but focuses more on strategies to compensate for any detriments to cognition. Although the research lacks up-to-date substantiation, specific benefits to attention and working memory performance have been reported by Palmese and Raskin (2000) and Cicerone et al. (2005). Evidence of objective gains in cognition has been lacking since these publications. Caplain et al. (2019) investigated the use of a "multidimensional management" approach, which used psychoeducation plus cognitive rehabilitation for participants at high risk of developing pPCS following mTBI. Results showed that 94% of treated participants did not have pPCS 6 months after injury, whereas 52% of the control patients had pPCS. However, follow-up studies have generally been lacking in the literature. Acceptance and commitment therapy, which aims to promote "living with" rather than "fighting against" a long-term health condition, has shown promise in a study by Whiting et al. (2012) and is subject to a randomized controlled trial planned for publication in 2023. There appears to be preliminary optimism for other psychological approaches.

Making a Case for EMDR

According to the 2013 World Health Organization practice guideline, eye movement desensitization and reprocessing (EMDR) "is based on the idea that negative thoughts, feelings and behaviours are the result of unprocessed memories. The treatment involves standardised procedures that include focusing simultaneously on (a) spontaneous associations of traumatic images, thoughts, emotions and bodily sensations and (b) bilateral stimulation that is most commonly in the form of repeated eye movements." Given its efficacy in treating PTSD (for a systematic review and meta-analysis see Cusack et al., 2016), EMDR treatment originally focused on treating psychological trauma. However, EMDR has continued to demonstrate effectiveness in a number of other conditions involving adverse life events and stress-mediated symptoms (Shapiro, 2014). Conditions of particular relevance to pPCS include depression (Wood et al., 2018), anxiety (Bandelow et al., 2015), panic disorder (Horst et al., 2017), migraine headaches (Marcus, 2008), functional neurological disorder (Cope et al., 2018), sleep disorder (Raboni et al., 2014), and medically unexplained symptoms and somatoform disorder (Van Rood & De Roos, 2009). One paper demonstrated that short EMDR intervention is feasible and potentially effective in the context of the post-concussion "like" symptoms in the emergency room (Gil-Jardiné et al., 2018). Other than this study, a literature review failed to retrieve any peer-reviewed specific papers written on the application of EMDR for brain injury or pPCS.

Indeed there has been a certain reticence around bilateral eye stimulation and brain injury, possibly due to perceptions of poor rapid eye movement tolerance in this population or perhaps a misconception of bilateral eye movements triggering epilepsy seizures (see successful applications of EMDR to epilepsy management by Schneider et al., 2005). Evidence suggests that risk of epilepsy development following mTBI is minimal (Huguenard et al., 2016; Wennberg et al., 2018) and there appears to be no evidence that bilateral eye movements trigger seizures. Additional reluctance to pursue EMDR perhaps stems from the intuitive idea that one can often be protected from distress if one cannot recall the event. However, mTBI is often associated with traumatic events, such as road traffic collisions, violent personal attacks, and military combat, that can cause profound psychological distress among the survivors. In 2011, Bryant's paper proved a turning point in the recognition that people can be traumatized following brain injury. Experience of this client group indicates that mTBI individuals may be traumatized by partial memories of the event itself, or in the "islands" of memory that follow. Other mechanisms which appear in clinical practice include a client's difficulty in understanding parts they cannot remember, difficulties in coming to terms with who might be at fault, and in some more severe cases of poly injury there are associated painful experiences during hospital recovery. The neuropsychological literature documents that mTBI is known to often cause organic emotional dysregulation and significantly increases the risk of psychological symptoms and stresses (see the 2010 meta-analytic review by Panayiotou et al., 2010).

Case Study

A case study follows to critically describe the use of EMDR for a client with mTBI and pPCS. The methodology aims to provide some preliminary evidence of psychological symptom improvement as they pertain to pPCS. The client gave permission to discuss his case, preserving his anonymity with a pseudonym and removal of identifiable information. "Dave" was a U.K.-born, mid-50-year-old man who suffered a serious road traffic collision as a pedestrian at a reported speed of 47 mph. As is common in probable mTBI cases, there was some debate as to neurological facts of his case. By chance the police were on the scene of the injury within a remarkable 4 minutes. According to police records there was an entry, "loss of memory," for Dave, providing some impartial evidence of at least a reduction in consciousness. Furthermore, Dave reported loss of memory and loss of consciousness in his statement and interview. On arrival by ambulance his Glasgow Coma Scale score (a method for measuring levels of consciousness from 3 to 15) was a healthy 15/15 and remained at that level, other than dipping while feeling "sleepy" during nursing care. Initial radiological investigation indicated organic traumatic brain pathology and even though the neurosurgeon was "not convinced" by this initial interpretation of the radiological evidence, he advised upon neuro-observations nonetheless. During the next 2 years, Dave had numerous tests and saw various specialists to rule out differential diagnoses. Approximately 26 months postindex event, he was referred to a U.K. consultant neurologist in private health care for private psychological treatment. Treatment was funded during active litigation for index event under the U.K. rehabilitation code of practice. The neurologist diagnosed the client with pPCS following his probable mTBI.

Assessment

Dave had a relatively healthy psychological history but had endured some stress from a relationship separation. Also, in the months prior to the index event, he had sought a health check from his general practitioner for feelings of chest palpitations, which may or may not have been stress mediated. In addition to reports of poor memory and poor decision-making, Dave's main complaint was the experience of "episodes" where he described becoming "confused," where his hands would often "turn blue," and his fingers would lose "coordination" and "dexterity." He stated that he would often "slur" his speech during these episodes. He described becoming "dizzy" and feeling the "need to sit down" during the "episodes." An example of key episodes involved a moment where he was asked to give money to a till operator. Another example included being asked his "check-in" details during a hotel stay. He also reported "episodes" being triggered at times during exercise and when being "out of breath." He had one initial "episode" in an unfamiliar city, which was his first and most severe "episode."

Dave's diagnosis was probable mTBI and pPCS. His pPCS symptoms were initially assessed as severe, but he also was assessed by clinical interview and standardized measures as meeting the threshold for PTSD, including experience of intrusive memories (flashbacks, etc.), avoidance (phobic/fears), and hypervigilance (heightened startle response/arousal levels). He had experienced a life-threatening event by way of the incident but was only partially conscious and so much of his trauma appeared to derive from the aftermath of the collision. He presented with anxiety and depression. Like many clients with mTBI and pPCS, Dave's most distressing memory was the hazy moment just before impact. He was also distressed by fragmented memories of receiving care and uncertainty regarding whether he was dying due to the severity of his injuries. His traumas had become linked to further traumatic experiences during his time in hospital, a phenomena similar to so called Intensive Care Unit Syndrome (sometimes referred to as Intensive Trauma Unit Syndrome). During the assessment it was immediately clear Dave had become extremely hypervigilant to physiological changes in his day-to-day life and was very "health anxious." He repeatedly sought medical investigations/explanations for his symptoms and had potentially somatized many of his concerns. He also reported severe memory, concentration difficulties, migraine, and vertigo, all of which he thought may be triggered by heart rate increase. He strongly denied feeling "anxious" during these episodes, as he believed that term dismissed the severity of his experience. He felt strongly that something physical was yet to be found wrong with him, which would provide an explanation and solution by way of medicalized treatment. Unusually, he denied feeling any hostility toward the driver, who was criminally convicted of drunk driving. Dave did not present as angry, but was certainly experiencing hyperarousal, flashbacks, and avoidance of triggering stimuli.

Measures

Dave completed six standardized measures of self-reported symptoms on five occasions: at pretreatment, midtreatment, posttreatment, 18-month follow-up, and at 4-year follow-up (post litigation). The measures were administered by the author and included the Rivermead Post Concussion Questionnaire (RPQ; King, 1997), Impact of Events Scale-revised (IES-R; Weiss & Marmar, 1997), the Generalized Anxiety Disorder-7 (GAD-7; Spitzer et al., 2006), the Patient Health Questionnaire-9 (PHQ-9; Kroenke et al., 2001), the Phobia Scale (National Health Service, 2011), and the Work and Social Adaptability Scales (WSAS; Mundt et al., 2002). The RPQ is a questionnaire designed to measure current post-concussion symptoms following a mTBI. It has 16 self-report items indicating cognitive, emotional, and somatic symptoms on an ordinal scale. Scores range from 0 to 65. Potter et al. (1996) reports means of mTBI individuals at follow-up 35.2 (SD 14.3). The IES-R is a measure of psychological trauma in a revised version to reflect impact upon level of distress from an event. It has 22 self-report items with scores ranging from 0 to 88. A score of 33 and above represents the best balance between type 1 and type 2 error in diagnosing PTSD. The GAD-7 is a brief seven-item self-report questionnaire of state generalized anxiety. Scores range from 0 to 21. The PHQ-9 is a nine-item self-report measure identifying state depressive symptoms. Scores range from 0 to 27. The Phobia Scale is a brief measure of social phobia, anxiety, and behavioral avoidance in response. The self-report questionnaire has three questions. Scoring is 0–8 on each question. The Work and Social Adjustment scale is a measure of impact and disruption upon five areas of daily life. Scoring is on a Likert scale. Scores range from 0 to 40. The GAD-7, PHQ9, Phobia Scale, and the WSAS are frequently used in primary mental health care in the United Kingdom. The Subjective Units of Disturbance (SUD) is an EMDR process scale used to determine current level of distress related to a traumatic memory on a

scale of 0 to 10 (0 is neutral and 10 extremely distressing). The Validity of Cognition (VOC) is an EMDR process scale from 1 to 7, measuring the client's belief in their selected positive cognition (1 completely false and 7 completely true).

Treatment

Dave received nine 1.5-hour EMDR sessions across a 5-month period. The first session was history taking and assessment. The midtreatment assessment was conducted after session 5.

Case Conceptualization. The Adaptive Information Processing model (Shapiro, 2001) considers symptoms of PTSD and other disorders to result from past disturbing experiences that continue to cause distress because the memory was not adequately processed. These unprocessed memories are understood to contain the emotions, thoughts, beliefs, and physical sensations that occurred at the time of the event. When the memories are triggered, these stored disturbing elements are experienced and cause the symptoms of PTSD and/or other disorders. Dave accessed psychological treatment with a diagnosis of pPCS following probable mTBI. It was clear that Dave's symptoms were stress mediated in part and he was also assessed as meeting the threshold for PTSD, reporting a breadth of intrusive memories (flashbacks, etc.), avoidance (phobic/fears), and hypervigilance (heightened startle response/arousal levels). He had reportedly experienced a life-threatening event by way of the index event but was only partially conscious, and so much of his trauma appeared to derive from the aftermath of the collision. Dave's post-concussion symptom severity was assessed using the RPQ. His RPQ scores were above mean plus one standard deviation for mTBI "follow-up" individuals. Items marked as "severe" problems included "dizziness," "sleep disturbance," "forgetfulness," "concentration," and "taking longer to think." He also disclosed associated anxiety symptoms "moderately severe" and depressive symptoms "severe."

First Half of Treatment. Once the assessment phase was completed, Dave became fully oriented to the model of EMDR. Dave's initial SUD score for the index incident was initially 8 (0–10, 10 being highly distressed by memories of the accident, and 0 feeling neutral toward memories of the accident). His Negative Cognition (NC) was at first a little difficult to define, but "I am vulnerable" was defined collaboratively. His Positive Cognition (PC) "I can cope with this" developed, and he rated this 2 (on a scale of 1 means completely false and 7 means completely true). After developing self-initiated grounding skills, relaxation techniques, and "safe place" imagery, therapy routinely focused on "going back to the body" to focus on changes to how his body reacted at times where he felt hypervigilant. This helped Dave feel validated, but also helped him begin to accept that many of the sensations he now felt were benign and were remnants of "old memories." "Going back into the body" seemed an effective technique of allowing him to reconcile the idea of "psychotherapy" being of value to the consequences of a very "physical" injury. Unsurprisingly he focused upon "feeling out of control and in danger," and such feelings could be used as a way of activating distressing memories from the injury itself and his care afterward. As per the protocol, tolerance to bilateral eye movements was tested, with particular scrutiny given his reported symptom of dizziness. He tolerated the bilateral eye movements well, and required little encouragement in moving through his collection of distressing memories during sets. Very little discourse was needed during these sessions, but some cognitive interweaves of reassurance were used to allow him to know that he was now safe. The artful use of validating language was very important during the initial half of his treatment. A joint language developed, which was acceptable to him in conceptualizing his symptoms. "Flight and flight" and metaphors of "stoves simmering" (representing his tolerance to stress) seemed to connect for him and appeared to validate his difficulties. At this midpoint Dave's psychometric measures demonstrated alleviation of psychological trauma severity symptoms, alleviation of mood disorder symptom frequency, and reduction in post-concussion symptom severity.

Second Half of Treatment. For Dave underlying feelings of helplessness, loss of control, guilt, and vulnerability were beliefs attached to his distressing memories. Following a focus upon the worst memory and other chained distressing memories, it became apparent that in the preceding months before his injury he had endured a distressing divorce. His distressing experiences had typically become chained together as one long string of distressing events, which left him feeling anxious and vulnerable toward the future. Treatment therefore went with this shift in focus, as Dave was developing his own insight into his relevant distressing memories. Following this he began to link to some earlier trauma of abandonment imposed in his early life, which seemed to represent new learning about himself and gave him a sense of personal growth or self-enlightenment. His measures

were all now looking very positive (see Results), and so we agreed to consolidate treatment with re-evaluation and working on the future to prevent relapse. Active EMDR treatment ended at this point. Dave agreed to a brief 18-month follow-up to readminister measures and to update on his overall psychological status, and a long-term follow-up following the settlement of his litigation claim (4 years following the initiation of treatment).

Results

Post-concussion symptom (RPQ) score at pretreatment was 50, over the mTBI cutoff. At end of treatment it reduced to 33, which is below mean for mTBI "follow-up" individuals at end of treatment. It appears the improvement in post-concussion symptoms generally maintained at follow-up and 4-year follow-up, but did not fully resolve. He reported continuing cognitive impairments in concentration, memory, and word-finding difficulties.

Posttraumatic stress symptom severity assessed on initial assessment as 53, which was consistent with Dave's diagnosis of PTSD. By midtreatment, it reduced to 31, reflecting his improving symptoms. At the end of all treatment Dave's posttraumatic Stress symptoms reduced further to 18, putting him at nonclinical levels. At 18-month and 4-year review his improvements had stabilized.

Anxiety symptom frequency on initial assessment was 12, reducing to 6 on midtreatment review. On final treatment Dave's anxiety symptoms reduced further to 3, which put him within "normal" ranges for anxiety (healthy). At 18-month review his anxiety had marginally increased but remained within "normal" ranges. This pattern continued at 4-year follow-up.

Depression symptom severity, assessed on initial review as 22, reduced to 12 on midtreatment review. On final treatment Dave's depression symptoms reduced further to 8, which put him within "mild" ranges for depression. "Mild" ranges of depression do not normally necessitate treatment. At 18-month review his depression score improvements had maintained. This continued at 4-year follow-up.

Phobia Scale severity, assessed on initial assessment as 9, reduced to 4 on midtreatment review. On final review Dave's Phobia Score reduced to 1, meaning that he has no significant difficulty avoiding situations which previously triggered symptoms. At 18-month review phobic behavior improvements were sustained. At 4-year follow-up, this appeared consistent. Dave reported minimal anxiety when walking past the site of the incident at the end of treatment.

The WSAS assessed on initial assessment as 26, indicating various functional limitations. At midtreatment review these reduced to 13, and at the end of active EMDR treatment Dave's scores reduced further to 6. Furthermore, Dave actively sought voluntary work. At 18-month follow-up Dave reported some re-emergence of health-related anxiety, but overall positively sustained improvements following the treatment ending. This was a similar scenario at 4-year follow-up.

Dave's SUD score (0–10, 10 being highly distressed by memories of the accident, and 0 feeling neutral toward memories of the accident) was initially 8 and reduced at midtreatment review to 6.5. On final treatment this had fallen further, to 1. At 18-month review it had marginally increased. His score was consistent at 4-year follow-up. Dave's VOC, "I can cope with this," scored at 2 and improved to 5 at end of treatment. At final 4-year follow-up this had maxed to 7.

Observational evidence was apparent as to Dave's changing beliefs toward his health, becoming generally more positive, and he more clearly understood

TABLE 1. Results

Measure	Initial Assessment	Midtreatment	Final Treatment	18-Month Review	5-Year Review
IES-R	53	31	18	18	19
GAD7	12	6	3	6	6
PHQ9	22	12	8	8	8
Phobia Scale	9	4	1	1	1
WSAS	26	13	6	5	5
SUDs	8	6.5	1	2	1
VOC	2	5	6.5	6	7
RPQ	50	40	33	34	34

mind–body connections. He placed less emphasis on checking symptoms and has demonstrated therapeutic progress in other domains. For example, he has actively sought voluntary work and reported that he had started creating paintings again, which he reportedly sold to customers. Dave also relayed feeling generally more settled in his life following treatment and appeared much less anxious at toward the end of treatment. At 18-month follow-up review, he reported some re-emergence of health-related anxiety but overall positively sustained improvements following the treatment ending. He reported ongoing litigation-related stress at this point in time and reported some recurrence of "episodes," albeit with less reported intensity and frequency. On a 4-year review, following litigation settlement, Dave reported a generally consistent psychological status, with improved sleep but enduring cognitive impairments in concentration, memory, and word-finding difficulties. This was substantiated in medicolegal expert evidence (forensic evidence as known outside the United Kingdom).

Discussion of Treatment Implications

This case study demonstrates preliminary usefulness for the application of EMDR to clients with mTBI and the psychological symptoms associated with pPCS. Results showed significant and consistent reduction in psychological symptomatology across treatment course, but not a complete alleviation in somatic and cognitive symptoms associated with pPCS at longer term follow-up. Importantly, there were no apparent adverse effects, such as iatrogenesis. This study had the benefit of long-term review after the settlement of litigation. Litigation typically involves repeating distressing accounts and feelings of being investigated, however this case study's success in alleviating psychological symptoms dispels any extreme and overly simplistic of pPCS being merely a product of "compensation-neurosis." In this case, there can be no definitive explanation for the nonresolution of pPCS for this client, but some established risk factors for incomplete recovery in pPCS include:

1. The relatively long time from index event to treatment in order for illness beliefs to form and symptoms to embed.
2. The ambiguity surrounding this client's health brain scans, diagnosis, and prognosis.
3. The unresolved somatic symptoms and cognitive impairments.
4. The long-term exposure to litigation-based stress during treatment and the difficulties in reducing distress to zero during treatment.

Unfortunately mTBI is in many ways more difficult to identify than severe brain injury and often more complex to treat and prognosticate. The uncertainty as to the presence and/or extent of organic injury continues to be problematic, and new research-based imaging techniques currently fall short of providing definitive evidence of organic injury in most cases. In an ideal clinical scenario, early intervention EMDR would follow a prompt and accurate diagnosis of mTBI with pPCS. It is hoped that the changes from a syndrome to a symptoms-based condition may help direct a substantial evidence base to the treatment of pPCS symptoms.

Recommendations

Further research is needed, of course. Single case series methodology would strengthen preliminary evidence for application of EMDR to pPCS. Case studies could be developed with neurocognitive measures for objectively measuring potential change in cognitive performance across treatment, including measures of cognitive effort to help substantiate the reliability of data. This may help develop our understanding of the applied neurocognitive benefits of EMDR for pPCS populations. Preliminary case study research to explore the application of EMDR for this subgroup may also be of value, leading perhaps to controlled group comparative designs. The author has also used EMDR with success with more severe brain-injured clients who have had distressing "islands" of memory during recovery involving posttraumatic amnesia and distressing and painful experiences within hospital. It is hoped that more clinical practice and research pursues the benefits and limitations of EMDR in brain injury.

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