

Eye Movement Desensitization and Reprocessing (EMDR) as a Treatment for Phantom Limb Pain

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Five consecutive cases of phantom limb pain were treated with EMDR. The time since the amputation ranged from one week to three years. Four of the five clients completed the prescribed treatment and reported that pain was completely eliminated, or reduced to a negligible level. The one client who stopped treatment chose to do so after reducing his pain by one half. The standard EMDR treatment protocol was used to target the accident that caused the amputation, and other related events. The five cases are described in detail. The treatment and theoretical implications are explored and recommendations are made for future research.

Although it would appear that upwards of 90% of individuals experience some sensation after surgery or accident (Kamen and Chapis, 1994), accounts of phantom limb pain (PLP) are vague and widespread. Researchers have suggested a number of reasons for this, including the subjective nature of PLP and the stigma associated with this type of pain. Kamen and Chapis (1994) noted, "because of the intangible, subjective sensation of PLP, the reports of incidence are widely scattered" (p.73). A study done by Sherman, R.A., Sherman C.J. & Parker, L. (1984) also found that many amputees are reluctant to report their pain due to concerns of being labeled insane. So, what is the percentage of patients suffering from PLP? This has never been accurately determined as studies have reported the incidence of PLP to lie somewhere between 0.5-13%, 30-75%, and 75-97%, with the greatest number of surveys reporting an incidence between 30-75%" (Kamen & Chapis, 1994). Similarly, Feinstein (1954) reported the incidence of phantom pain as ranging from one to fifty percent. Jensen and Nikolajsen (1999) reported that PLP is experienced in 60 to 80% of amputees and it has been shown that up to 70% of amputees experience PLP for 25 years or more following an amputation (Sherman et al, 1984). Although the incidence of PLP has not been clearly established, it is clear that PLP is associated with significant distress.

Phantom pain is typically described as burning, cramping, and stabbing in nature, though amputees frequently report sensations similar to the pain experienced in their limbs prior to amputation (Katz & Melzack, 1990). Melzack (1990), in his conceptualization of

the “neuromatrix,” has drawn attention to the inadequacies of present causative explanations and has focused attention on central, rather than peripheral, mechanisms. Research involving animals and humans has clearly documented the reorganization that occurs in the somatosensory cortex following deafferentation. Recent neuroimaging studies (Birbaumer, Lutzenberger, Montoya, Larbig, Unerti, Topfner, Grodd, Taub, & Flor, 1997; Flor, Elbert, Knecht, Wienbruch, Pantev, Birbaumer, Larbig & Taub, 1995; Flor, Elbert, Muhlneckel, Pantev, Weinbruch & Taub, 1998 and Grusser, Winter, Muhlneckel, Denke, Karl, Villringer & Flor, 2001) have demonstrated the link between the reorganization of the somatosensory cortex and phantom limb pain in amputees. These research findings suggested the intriguing possibility that cortical reorganization may be the neurophysiological basis of phantom limb pain rather than a normative, adaptive process (Katz, 1992).

There are many different strategies for dealing with phantom pain, because of its subjective and diverse nature (Sherman, 1997). However, given the findings noted above, the investigators recommended treatments aimed at effecting cortical reorganization through behavioral or pharmacological means. Effective pharmacological treatments have included β -blockers, central nervous system serotonin agonists, the tricyclic antidepressants, and calcitonin (a polypeptide hormone) (Kamen & Chapis, 1994). In terms of behavioral interventions, Ramachandran and Hirstein (1998) documented a procedure that utilized a “mirror box” to enable some upper limb amputees to move their painful phantoms (the unaffected limb is viewed as a virtual reflection of the phantom limb) with accompanying pain relief.

Harris (1999) proposed that phantom pain is the result of incongruence between motor intention, awareness of movement, and visual feedback. He postulated that treatments, such as the mirror box, restore cortical information processing through perceptual-sensory training and feedback. While the effect of the mirror box technique on cortical reorganization and the relationship to pain relief is unknown, this technique shows promise in altering the perception of pain through noninvasive means. To date, no randomized controlled research has replicated the initial case findings.

Case reports involving the use of Eye Movement Desensitization and Reprocessing (EMDR) have indicated that this may be another effective, noninvasive PLP treatment option. The first published case of phantom limb pain EMDR treatment involved a Colombian adolescent whose leg pain was completely eliminated by focusing on her traumatic experience and pain sensations; positive results were maintained at a two-year follow-up (Shapiro & Forrest, 1997). In treating ten amputees with phantom limb pain, Wilson, Tinker, Becker, Hofmann & Cole (2000) reported that seven of the ten experienced no pain following the use of EMDR.

Eye Movement Desensitization and Reprocessing (EMDR) has been described as an integrative psychotherapy (Shapiro, 2002), due to its assimilation of various elements from diverse psychotherapies. Since its introduction in 1989, numerous controlled studies have been conducted to evaluate EMDR’s utility as a treatment for various forms of trauma-related complaints, including PTSD. The positive results have established EMDR as an effective trauma treatment and have prompted numerous professional organizations to recognize its efficacy, beginning with the American Psychological Association’s (APA) Division 12 Task Force on Psychological Interventions (Chambless et al.) in 1998. Since then, the International Society for Traumatic Stress Studies (Chemtob, Tolin, van der Kolk, & Pitman, 2000), the Israeli National Council for Mental Health (Bleich, Kotler,

Kutz, & Shaley, 2002), and the Northern Ireland Department of Health (Clinical Resource Efficiency Support Team, 2003) have also supported EMDR. Most recently, the US Departments of Defense and Veterans Affairs (2004) provided EMDR with the highest level of recommendation, as did the American Psychiatric Association Practice Guidelines (2004).

A number of controlled studies have compared EMDR with other forms of treatment for PTSD. Cognitive-behavioral therapy (CBT) and EMDR were found to be equally effective, though EMDR's effects often were achieved more rapidly and/or without the use of homework (Ironson, Freund, Strauss, & Williams, 2002; Lee, Gavriel, Drummond, Richards, & Greenwald, 2002; Power, McGoldrick, Brown, Buchanan, Sharp, Swanson, & Karatzias, 2002; Rothbaum, 2001; Taylor, Thordarson, Maxfield, Fedoroff, Lovell, & Ogrodniczuk, 2002; Vaughan, Armstrong, Gold, O'Connor, Jenneke, & Tarrier, 1994).

While it is clear that EMDR is emerging as a sound therapeutic option, the Adaptive Information Processing (AIP; Shapiro, 1995, 2001) model, which is the theoretical framework for EMDR, illustrates the broad applications of EMDR treatment. According to the AIP model, a neurobiological system processes perceptions through associations between the new information and relevant stored memories. In addition, this information processing system facilitates learning by linking disturbing experiences with more adaptive information. Thus, disturbing thoughts, emotions, and bodily sensations are resolved by associations to the relevant information, which functions first to interpret the experience and then to store it appropriately through assimilation into comprehensive memory networks. Processing results in the transfer of information from implicit to explicit memory systems (Shapiro, 2001; Stickgold, 2002) in networks that no longer contain the disturbing affects and sensations.

While the process described above is thought to occur naturally and functions well under normal circumstances, traumatic experiences are often accompanied by intense affect and dissociation, which can block this process. Consequently, the information associated with the upsetting event (e.g., images, thoughts, emotions, and sensations) may then be dysfunctionally stored within the memory network, essentially isolated from any potential adaptive information. Since this unresolved material is easily triggered during similar experiences, the individual may notice intrusive thoughts, emotions, and somatic responses. These automatic responses can severely impair one's ability to function, thus contributing to various forms of psychopathology, including mood, anxiety, and personality disorders (Brown, McGoldrick, & Buchanan, 1997; de Jongh, Ten Broeke, & Renssen, 1999; Manfield, 1998; Manfield & Shapiro, 2003; Shapiro & Brown, in press; Shapiro & Forrest, 1997)

The AIP model posits that many forms of chronic pain are the result of the inappropriately stored somatic memory of the traumatic event. Thus, reprocessing the sensory experiences and traumatic events (with respect to the affected limb) that occurred before, during, and after the amputation is thought to facilitate resolution of phantom limb pain (Wilensky, 2000). As noted by Ray & Zbik (2001), the AIP model is distinct from the one that underlies cognitive behavioral therapy (CBT) and the application of EMDR appears to result in different treatment effects than those achieved by traditional treatments.

The following five cases illustrate EMDR's ability to utilize a standardized protocol to target unresolved memories involving physical trauma and subsequent amputation. Each targeted memory or issue is processed through eight phases of treatment (see Shapiro,

2001 for details). Once a thorough history has been taken (Phase one: Client History and Treatment Planning), the client is taught self-control techniques, such as a “Safe Place” exercise which evokes positive imagery and affects to be accessed by the client (Preparation Phase). After it has been determined that the client has the skills necessary to tolerate the potential intensity of the treatment (Phase two: Preparation), a target memory is identified and baseline measures are gathered (Phase three: Assessment). The client identifies negative cognitions (e.g., I’m weak), feelings, images, and bodily sensations associated with the event and provides an indication of the level of disturbance using the Subjective Units of Disturbance (SUD; Wolpe, 1958) scale (0 = neutral and 10 = the worst disturbance possible). A positive desired belief is also identified (e.g., I’m strong) and its strength is determined on the 1 (completely false) to 7 (completely true) Validity of Cognition scale (VOC; Shapiro, 1989, 2001). The next four phases of treatment focus on processing the disturbing event using eye movements or other forms of dual attention stimulation (e.g., bilateral hand taps or auditory tones), while simultaneously focusing on the information gathered during the assessment phase. Once the disturbance has been resolved (Phase four: Desensitization) the positive cognition is strengthened (Phase five: Installation), further physiological discomfort is identified and targeted (Phase six: Body Scan), and the client is prepared to monitor and manage further processing between sessions (Phase seven: Closure). Treatment progress is evaluated in the subsequent sessions (Phase Eight: Reevaluation) and further targets are chosen.

Case Studies

Measures

Impact of Event Scale – Revised (IES-R; Weiss & Marmar, 1997). This scale was designed to measure current subjective distress associated with a particular event. The IES-R was based upon the original IES (Horowitz, Wilner, & Alvarez, 1979) and measures intrusive, avoidance, hyperarousal, and numbing symptoms. On the original scale scores above 26 indicate a moderate to severe impact associated with the specific event.

The Pain Disability Index (PDI; Chibnall & Tait, 1994). The PDI measures the impact of pain on one’s ability to participate in essential life activities. The areas measured include family and home responsibilities, recreation, social activity, occupation, sexual behavior, self-care, and life-support activity (e.g., eating, sleeping, breathing, etc.). The higher the index, the greater the pain-related disability will be.

Trauma Symptom Inventory (TSI; Briere, 1995). The TSI was designed to measure posttraumatic stress and other psychological trauma. The ten clinical scales include: Anxious Arousal, Dissociative behavior, Depression, Sexual Concerns, Anger/Irritability, Dysfunctional sexual behavior, Intrusive Experiences, Impaired Self-reference, Defensive Avoidance, and Tension Reduction Behaviors. Three validity scales have also been included.

The Beck Depression Inventory (BDI; Beck & Steer, 1993) and The Beck Depression Inventory, 2nd Edition (BDI-II; Beck, Steer, & Brown, 1996). The BDI and the BDI-II assess the intensity of depressive symptoms. The BDI-II was modified according to the DSM-IV criteria.

Participants

The author contacted a psychologist at the Workers Compensation Board Amputee Unit. She was told of the state of EMDR research, and preliminary reports of its effectiveness with PLP. An invitation was extended to work with three of the patients at the rehab unit with members of the psychology department watching behind the mirror. The final two patients were recruited through others hearing of the research interest and were treated in the author's clinical office (Dave) and in the hospital (Edith). The patients were told that EMDR would be used in an exploratory attempt to alleviate the physical disturbance attendant to their condition. They all wished to engage in the research. The cases are reported in the order they were treated and constitute the entire group of patients who were given EMDR treatment for PLP. Fictitious names have been assigned in alphabetical order.

Results

Table 1: Overview and Pre-Post Treatment Evaluations

	Age	Time since amputation	Lost body part	Number of sessions	Pain 0-10 pre/post	Standard Psychometric pre/post
Al	39	3 months	foot	5	10/0	IES 65/25 PDI 45/14
Bert	25	2 months	foot	3	7/1	IES 67/35
Chuck	43	3 years	arm	9	8/4	BDI 34/11 PDI 49/22
Dave	55	5 months	finger	8	5/1	IES 55/5 TSI 6 scales >65/all<65
Edith	66	1 week	leg	3	8-9/0	

IES-Impact of Event Scale **BDI-Beck Depression Inventory** **PDI-Pain Disabilities Index**
TSI-Trauma Symptom Inventory—significant scales: Depression, Dissociation, Anger/
 Irritability, Defensive Avoidance, Intrusive Experiences scales (65 = clinical cut off)

Al

Al, a 39-year-old male, had experienced numerous physically traumatic events throughout his childhood, all involving his left foot, which was the foot that eventually required amputation. He had also experienced physical abuse as a child, had a long history of substance abuse, and had previously attempted suicide. While working in a steel factory, Al's left leg was crushed when 20 tons of steel fell on him and was eventually amputated just above the knee. He presented for EMDR treatment three months after the accident and reported significant pain (10 out of 10), as well as a fear of elevators and stairs since the accident.

Al participated in five EMDR sessions. After gathering assessment/history information and completing the Safe Place exercise, the accident was reprocessed. The first target was the accident itself. Al pictured himself trapped and imagined the crashing sound. Al reported considerable sensory information, such as heat, ballooning of the foot, and squeezing in the amputated leg. Al's negative cognition was "I'm useless" and he wanted to believe "Nothing will stop me." Although his distress was high during this session (SUD = 8), a pivotal moment occurred, involving a brief pain-free moment. This introduced Al to the possibility that he was going to be okay.

Subsequent sessions targeted memories associated with seeing his "stump" for the first time, as well as the idea of himself as a "cripple." He experienced anger and fear during the reprocessing. Early material also began to emerge, which involved memories of his early accidents (e.g., a spike through his left foot, broken toe, torn ligaments, fractures, and more). Interestingly, Al's pain was not alleviated until these early memories were reprocessed. Between the fourth and fifth sessions, Al went skydiving with an instructor, and, by the end of treatment, he was able to use elevators and stairs without any discomfort. His SUD levels, which ranged from 5 to 10 at the beginning of treatment, decreased to 1. Similarly, Al's pain, which had been at a 10 (out of 10), was completely alleviated by the end of treatment and he no longer required pain medication (However, his pain was momentarily triggered by diet soda and an electrical storm). Al strongly believed "It's (the pain) over" (VOC = 6). His PDI scores, which ranged from 5 to 9 before treatment, had decreased to 0 to 4. Similarly, his IES-R score decreased from 69 to 25 from pre- to post-treatment.

Bert

Bert, a young man in his mid-twenties, had experienced a troubled childhood, which included physical abuse. His mother left the family when he was about two or three years of age, and his grandparents raised him. He worked as a tree planter for six years and considered himself to be a "recreational logger." After a log rolled over his leg, he experience serious injuries that led to the amputation of his lower right leg. Prior to beginning treatment, Bert was drinking six beers per night.

Bert began EMDR treatment two months after his accident. Although the intensity of his pain varied in that it was worse at night, it was concentrated in the areas that once were his foot, arch, and toes. The pain, which he rated at 4 out of 10, interfered with his ability to sleep, which he was unable to do for more than three hours at a time. Bert participated in a three EMDR sessions. After gathering some history and assessment information during the first session, Bert participated in the Safe Place exercise. The accident was also targeted

and processed with EMDR during the first session and Bert identified the image of seeing his leg go under the log. His negative cognition reflected the issues of responsibility and incompetence, "I'm weak." Instead, he wanted to believe that "there is strength to be had."

By the second session, Bert had experienced a brief period of no pain and expressed significant hope in his statement, "If it stays like this, I'm okay." He also reported periods of less intense pain. During the second session, the sensation of pins and needles was targeted. Bert's negative cognition, "I'm a failure," may have reflected some earlier memories, but the target was successfully processed. By the third session, Bert was reporting more pain-free periods, which allowed him to sleep more. SUDS went from 7-8 to 1. The third session was spent processing the physical sensations. As his pain decreased, Bert began to wear his prosthesis, which he had not done previously. He also began exercising at the gym, driving, and decreased his alcohol use.

By the end of treatment, Bert's pain and SUD levels had decreased from a 7 to a 1, on a scale measuring 0 to 10. His final positive cognition, which he strongly believed (VOC = 6), reflected a newfound strength and hope. Bert stated, "I'm going to kick some ass." Bert's total score on the IES-R, which measured the distress associated with his accident, had decreased from 67 (pre-treatment) to 35 (post-treatment). While this is still a clinically significant score, Bert was content with his level of functioning by this point in treatment and chose to end his involvement.

Chuck

Chuck, a 43-year-old millwright, was married and had adolescent children. His father had previously required an amputation as a result of his diabetes. Three years prior to beginning EMDR treatment, Chuck's left arm was caught in the rollers at the paper mill, resulting in an amputation. Chuck had previously experienced a near death experience after being electrocuted and he found that anything resembling electricity triggered his pain. The constant and intense pain he experienced since the accident, which rated at an 8 to 9 out of 10, led to suicidal ideation and eventual voluntary hospitalization.

Chuck participated in nine EMDR sessions. The first session targeted the accident directly. Chuck remembered his arm caught in the rollers and his head smashing on a beam as he was thrown to the ground. His negative cognition was "I'm dead" and he wanted to believe "I'm alive and doing fine." During the reprocessing, Chuck felt his "hand" uncurl and noticed a cooling sensation. This brief moment of relief, which was his first experience of this nature, instilled great hope in Chuck. His SUD level decreased from an 8 to a 3 (out of 10). Subsequent sessions continued to target the accident and then the sensations directly.

Between the fourth and fifth sessions, Chuck awoke pain-free for the first time in three years. Although the pain eventually returned, it was less intense (4, instead of 8 out of 10) and Chuck continued to feel hopeful. Between the fifth and sixth sessions, Chuck experienced another 15 minutes of relief and noticed the feeling that his arm was "shortening." This sensation of shortening is a positive sign as phantom limb pain has been positively correlated with the telescoping of the phantom limb ($r=0.43$), with telescoping also being significantly positively correlated with cortical reorganization ($r=0.57$; Grusser, Winter, Muhlneckel, Denke, Karl, Villringer & Flor, 2001). At this point, concern for his

family arose, which led to the processing of the many deaths in his family and his father's pain after the war. Between the sixth and seventh sessions, which included the anniversary of his accident, Chuck noted that he did not have to ice his arm for a couple of days. After processing a memory of a previous car accident in the seventh session and targeting the sensations of heat and sweatiness in his hand, Chuck noted the strong belief that he was getting better.

Prior to the last session, Chuck completed a First Aid Course, which involved two full days of training, and attained his commercial drivers' license. He had also been experiencing fewer spasms and his arm felt shorter (about waist level). After completing his last session, Chuck attained employment in a group home for children and stopped taking his pain medication. He reported a feeling of well-being and enhanced clarity. Feeling almost euphoric, Chuck stated the strong belief, "I can find my way" (VOC = 6). Overall, Chuck was so pleased with the considerable decrease in his pain (from 8 to 4 out of 10), that he felt he needed no further treatment. He had acquired an effective pain management strategy, which involved imagining the icy cold lake that first appeared in his Safe Place Exercise. Chuck's scores on the Pain Disabilities Index (PDI) ranged from 6 to 8 (moderate to severe) at pre-treatment and decreased to 3 to 4 (mild) at post-treatment. His depressive symptoms, as measured by the Beck Depression Inventory and Beck Depression Inventory II, respectively also decreased considerably, from a pre-treatment score of 34 (Severe) to a post-treatment score of 11 (non clinical to Mild). Furthermore, Chuck's pre- to post-treatment scores on the IES-R decreased from 58 to 36. Since Chuck was satisfied with his level of pain and was able to function effectively in his job, he did not engage in further treatment or follow-up.

Dave

Dave, a man in his late forties, had 30 years of experience as a sheet metal worker. His father, who had alcohol use issues, had physically abused Dave as a child. Dave also experienced some significant losses in his life, including the traumatic death of his brother in 1980 and the death of his father when he was an adolescent. Dave had a history of depression and substance abuse, which included alcohol and serious street drugs (e.g., heroin), though he had been abstinent during the nine months prior to EMDR treatment.

Dave presented to treatment after experiencing a serious bilateral crush hand injury that resulted in the amputation of the middle finger of his right hand. He had experienced two previous serious hand injuries and had endured multiple surgeries over the preceding few years. Other distress associated with the accidents included trouble with the Workers Compensation Board, mistakes with his benefits, and having a plate in his hand broken in the Hand Clinic. Dave eventually hired a lawyer to assist him with some of these difficulties. After his most recent accident, Dave began to experience panic attacks, which occurred when he was away from home.

Dave participated in eight EMDR sessions, which occurred five months after his accident. After gathering the relevant information and adequately preparing Dave for the EMDR processing, the accident was chosen as a target. Dave recalled being unable to get up after the accident and someone saying, "Your finger's gone." He also pictured his glove getting caught in the machine. His negative cognition was "I'm an idiot" and he wanted to believe "I can do something." After reprocessing, Dave's SUD level decreased

from 8 to 2. The sensation was also targeted and his pain decreased from 5 out of 10 (“like cannonballs burning”) to 0 (tingly). The incident was targeted again later and his positive cognition changed somewhat, to “It’s not my fault.” Dave identified feelings of dread and embarrassment, which he noticed in his chest. In the end, his SUD level had decreased to 0. His positive cognition had transformed once again to “I can take charge of my life again,” which he fully believed as reflected by a VOC of 7. Other sessions focused on Dave’s previous accidents, treatment, and family of origin issues, including targets related to his brother’s death and his wife’s leukemia diagnosis. The panic attacks were also targeted and reprocessed using EMDR. Every few days, Dave used a CD with bilateral sounds to successfully manage his pain between sessions.

By the end of treatment, Dave no longer exhibited any signs of trauma, as measured by the Trauma Symptom Inventory, which indicated pre-treatment elevations related to Anxious Arousal, Anger/Irritability, Intrusive Experiences, Defensive Avoidance, Dissociation, Trauma, and Dysphoria. Post treatment there were no clinical elevations. Furthermore, his pain had decreased from 5 to 1. He no longer required the use of prescribed medications, including Tylenol #3, Amitriptyline, and Prozac. Prior to treatment, Dave had been unable to visit his jobsite due to feelings of humiliation and panic. Following treatment, Dave visited the jobsite and was able to discuss the incident without any distress. His nightmares also disappeared and he noted that he had been able to watch a commercial about somebody hurting his finger without distress. Dave’s IES-R score decreased from 55 to 5. Dave was seen one year after treatment and his treatment gains had been maintained.

Edith

Edith was a 66-year-old college-educated woman who had been married for 35 years. She had participated in previous psychotherapy after a tumultuous time during adolescence. Edith had presented for EMDR treatment one week after having her leg amputated at the hip due to cancer. She participated in three sessions of EMDR while in the hospital and another two sessions (with another therapist) after her discharge. Prior to EMDR treatment Edith was experiencing extremely high levels of pain (8-9 out of 10) that was not ameliorated by pain medication (Neurontin).

Interestingly, during the desensitization phase of treatment, as the pain was targeted directly, memories related to childhood surfaced. The negative cognition associated with these memories was “I’m not good enough.” Once these early memories were “cleared,” Edith’s pain was alleviated completely. During the course of treatment, Edith had seen her image, without her leg, in the mirror for the first time, which was the source of considerable distress. This was reprocessed in session and her SUD level decreased from 8 to 4. However, after once again targeting family of origin issues, Edith’s SUD level decreased to 0.

In a correspondence sent by Edith three years later, she noted that she no longer experienced chronic phantom limb pain after treatment was completed. However, she did experience very occasional pain episodes (not phantom pain), which appeared to be triggered by specific events, such as sitting for long periods or moments of intense stress/fear. Edith had been able to utilize some effective coping strategies, such as moving around when possible, using a special cushion, planning ahead (including visualization

Discussion

This article reports the results of five consecutive cases of PLP treated by the author. The time since the amputation ranged from one week to three years. Four of the five clients completed the prescribed treatment and reported that pain was completely eliminated, or reduced to a negligible level (1 out of 10). The one client who stopped treatment did so after reducing his pain by one half, which was tolerable to him.

The standard EMDR treatment protocol (Shapiro, 1995) involves the processing of the earlier events that set the groundwork for the pathology, as well as the present triggers, and an imagined positive future. In these five cases, not only was the accident targeted, but also a number of times it was necessary to process earlier memories that appeared to be related. For instance, in Al's case the pain did not remit until earlier memories of accidents involving his foot were targeted. This is consistent with the AIP principle that the physical sensations of those events were dysfunctionally stored as well. In Edith's case, targeting the pain resulted in the emergence of childhood memories informing the sense of "I'm not good enough." It is therefore recommended that although the identified treatment goal is the remission of the pain sensation, a thorough history should be taken to identify earlier contributing events.

The difference between treatment of the entire clinical picture and the overt symptom reduction desired by the client is of additional interest. For instance, although four of these clients reported troubled or abusive childhoods, they were not comprehensively treated, except when memories emerged during processing. In two instances, elevated IES scores reduced but did not fall below clinical levels. Both of these clients requested termination of treatment once their personal pain reduction goals were met, despite current triggers that were contributing to the stress reactions. Whether Chuck's pain could have been completely reduced in the course of complete treatment is unknown. Future research should attempt to evaluate whether systematic processing of the comprehensive history contributes to more rapid or robust effects.

In all cases the EMDR pain treatment resulted in not only the reduction of pain, but also an increase in a positive sense of self. Indeed, identified negative cognitions ("I'm weak," "I'm stupid," "I'm useless") were replaced by an increased sense of self-efficacy and self-determination. The behavioral indicators of change included the new use of a prosthesis (which had been previously ignored), taking a First Aid Course, skydiving, obtaining a commercial driver's license, and returning to the accident site without discomfort. Therefore, one of the variables worthy of investigation in future studies is the degree to which various treatments result in global indicators of change.

Although the observed reduction of pain is promising, the lack of follow up and independent evaluation limit the current findings. However, two of the five cases reported a continued cessation of PLP at one year (Dave) and at three year follow up (Edith). Therefore, the consistency of results among all treated cases strongly encourage the utility of more rigorous research of the application of EMDR to this previously intractable condition.

It should also be noted that the number of sessions ranged from three to nine, which correlated with the amount of time since the accident. This may indicate that the sooner the pain client is treated after the amputation, the quicker remission can be achieved. On the other hand, the fact that the remediation of leg pain was consistently achieved in fewer

sessions than in the cases of finger and arm pain may prove to be the determining variable (e.g., greater representation of upper limb in the sensory cortex). Also worthy of evaluation is the degree to which premorbid history, including unresolved losses (as in the case of Chuck) might impact treatment.

The AIP model which guides EMDR practice posits that once the precipitating event and attendant sensations are thoroughly processed, the phantom pain should remit. As noted by Ray and Zbik (2000), the permanent elimination or relief of chronic pain reported with EMDR appears distinct from outcomes of CBT treatment that generally entail self-monitoring and pain management. Further rigorous studies with large randomized samples comparing these two forms of treatment and investigating the aforementioned variables are strongly recommended.

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