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Management

Eye movement desensitization and reprocessing treatment of chronic pain

MD Grant[1*]

Abstract

Introduction

Following its acceptance as an empirically validated treatment for PTSD, Eye Movement Desensitization and Reprocessing therapy (EMDR) has been the subject of a number of reports involving pain, especially pain associated with psychological trauma (eg; phantom limb pain). This study investigated the effectiveness of EMDR therapy in the treatment of chronic pain of heterogenous origin. Based on previous reports, it was hypothesized that EMDR would lead to decreased pain, emotional distress and disability. Pain relief has been an elusive goal for mainstream psychological approaches to pain management.

Materials and methods

Eleven outpatient chronic pain sufferers received an average of 10 sessions of EMDR therapy for pain, with four EMDR-trained psychologists. All patients completed pain questionnaires and mood inventories before treatment, after treatment, and at 6-months follow-up.

Results

At treatment termination, participants reported decreased pain, PTSD symptoms, disability and depression; and increased self-efficacy. This was statistically supported through the use of within-subjects one-way ANOVA's and paired t-tests. There were also significant linear relationships for all of the tests where ANOVA's were performed. Use of Cohen's d statistic indicated that all of the comparisons had large magnitudes of difference. Treatment gains were maintained in four of the seven subjects for whom follow-up data were available.

Conclusion

The results suggest that EMDR may be able to stimulate significant and long-lasting pain relief for chronic pain sufferers, particularly those whose pain is associated with intense emotional distress.

Introduction

Chronic pain is a complex problem involving overlapping physical, emotional and behavioural pathology. According to the International Association for the Study of Pain (IASP) chronic pain involves suffering from pain in a particular area of the body (e.g.; in the back or neck) for at least three to six months[1]. Chronic pain also comes in many different forms, including Chronic Low Back Pain (CLBP), Chronic Regional Pain Syndrome (CRPS), arthritis pain and Fibromyalgia. Chronic pain can originate from a variety of sources including illness, injury including traumatic events such as assault, motor vehicle accidents and military combat[2]. Despite extensive research, traditional psychological treatments of chronic pain suffer from high drop-out rates, weak treatment effects and weak retention of treatment effects[3]. Exploration of new methods is needed[3]. Eye Movement Desensitization and Reprocessing (EMDR) is a trauma treatment which has shown some promise with pain[4,5]. Given EMDR's efficacy with trauma, the correlation between trauma and pain, the limitations of traditional treatment methods, and the need for new pain treatments, further exploration of EMDR treatment of pain is warranted.

Psychological treatment of chronic pain is dominated by Cognitive Behaviour Therapy (CBT). This approach is based on a conceptualization of chronic pain as being maintained or exacerbated by maladaptive thoughts, feelings and behaviours and that changing these can alleviate the effects of pain, if not the pain itself. The main elements of CBT treatment of pain are challenging negative beliefs, relaxation training, activity scheduling (pacing) and goal-setting[6]. Although the method has been researched extensively over several decades, its efficacy is limited. A recent Cochrane review concluded that although CBT can help reduce mood problems and disability associated with pain, it has "weak effects" in improving pain and that its overall effects are small, as they are for all psychological treatments of pain[7]. The authors also found that there was no clear theory regarding the mechanisms of change in CBT trials and a lack of clarity regarding specific and non-specific effects of therapy. They also noted that central assumptions such as deconditioning and poor physical status in chronic pain remain unsubstantiated. The reviewers concluded that better theories are needed to generate hypotheses about processes and mechanisms of change.

EMDR therapy started out as a treatment for Posttraumatic Stress Disorder [8] and is now an empirically validated treatment[9,10,11]. In the treatment of PTSD, which is the most researched application of the method, EMDR appears to have some advantages over traditional approaches. For example, Ironson et al.[12] found that EMDR was more efficient and better tolerated than exposure in the treatment of PTSD. A meta-analysis comparing EMDR with TFCBT (Trauma-focused CBT) found that EMDR required

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Competing interests: None declared. Conflict of interests: None declared.
All authors contributed to conception and design, manuscript preparation, read and approved the final manuscript.
All authors abide by the Association for Medical Ethics (AME) ethical rules of disclosure.

FOR CITATION PURPOSES: *Grant MD. Eye movement desensitization and reprocessing treatment of chronic pain. OA Musculoskeletal Medicine 2014 Aug 17;2(2):17.*

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significantly few hours of homework to achieve the same results as TFCBT[13].

The range of applications of the method has also expanded to include a variety of psychological conditions including addictions, phobias and anxiety disorders, depression, grief and chronic pain, although these are not yet empirically validated. EMDR is indicated for chronic pain because of its efficacy with PTSD, a condition with a high comorbidity with chronic pain[14]. Another reason EMDR might be effective with chronic pain is the many similarities between PTSD and chronic pain including elevated emotional distress, increased emotional liability, avoidance, hyperarousal and hypervigilance[15,16]. Finally, PTSD and chronic pain appear to involve similar structural and functional phenomena in the brain, including lateralization effects[17,18,19]. Overall these similarities constitute a shared vulnerability and mutual maintenance.

Since the first case-study regarding EMDR treatment of burn pain[20] EMDR has been reported to be efficacious with a variety of conditions including chronic low back pain (CLPB)[21], headaches and fibromyalgia[3,22], and phantom limb pain[23,24,25]. To date there are over 20 research reports regarding EMDR treatment of pain, consisting of case-studies, controlled and uncontrolled clinical trials, involving over 100 patients[26]. So far the method seems to be most effective with pain which is associated with trauma, particularly phantom limb pain[27]. This is not surprising given EMDR's efficacy with trauma, but given the relatively small number of studies involved it also leaves open the question of whether EMDR may be efficacious for other types of pain.

PTSD and chronic pain are both disorders whose aetiology is substantially viewed in terms of adverse past events. Associated with this the theoretical model underlying EMDR, the Adaptive Information Processing model (AIP) posits that psychological problems in the present are based on maladaptively processed memories of past events which need to be assimilated with existing memory networks[28]. It is postulated that the human nervous system normally does this naturally, through the integration of new experiences with pre-existing memory networks but that trauma disrupts this natural processing capacity. Traumatic memories are thought to be stored in a state-specific form, including unprocessed physical and emotional responses, which lead to increased reactivity and decreased ability to cope with later stressors[29]. In this way the AIP model is also consistent with the kindling/central sensitization model of chronic pain which posits that repeated exposure to painful stimuli leads to increased sensitivity to later noxious stimuli[30].

Operationally EMDR therapy also works differently to traditional approaches. For example, one of the key change processes in EMDR is accessing internal positive memory networks, as opposed to externally providing "corrective information"[31]. Another novel feature of EMDR is the use of dual-focus of attention and bilateral stimulation (bls). Explanatory models of EMDR draw on various areas including behaviourism; e.g., the orienting response[32], brain science; e.g., increased hemispheric communication,[33] and memory research; e.g., working memory[34]. Research support for these models is in its early stages but bilateral stimulation has been found to activate brain processes consistent with memory processing and reconsolidation[35] and a recent meta-analysis concluded that it was an essential element of EMDR and that a theoretical rational existed for its use[36]. With its incorporation of brain processes, attention and memory, the AIP model is also more compatible with recent trends to view psychological problems as a product of an interaction between the brain and the environment rather than linear, uni-directional processes[17,35]. The appeal to brain processes in attempting to explain how EMDR works is consistent with current trends to view (and treat) pain as a brain problem[37]. As Melzack[38] has noted, "the brain is the repository of our fears and anxieties…It is for this reason that the link between pains experience and behaviour is so variable."

The originator of EMDR therapy, Dr Fancine Shapiro proposes that information processing in EMDR involves three processes: (a) deconditioning associated with a relaxation response; (b) neurological changes in the brain that activate and strengthen weak associations; and (c) the client's dual focus of attention on both the distressing memory and concurrent tasks, i.e., Bls[39]. Evidence regarding the contribution that bls makes to treatment outcomes following EMDR therapy has taken some time to be established, but a recent meta-analysis concluded that the effect for eye-movements was significant, particularly in studies with high treatment fidelity[40]. Moreover, the key therapeutic effect of Bls appears to be a distancing effect rather than desensitization[41]. Bls has also been found to produce a number of physical and mental changes that suggest EMDR could be effective with pain including reduced emotionality (in PTSD sufferers), relaxation and decreased autonomic arousal[42,43]. In considering how these effects might ameliorate pain Ray & Zbik have suggested that EMDR separates and permanently "de-augments" the affective component of traumatic memories and pain[44]. They suggest that this gives EMDR an added dimension to more traditional approaches (e.g., CBT) which may improve a person's perception of pain and quality of life, but don't generally offer a permanent change in the affective dimension of pain.

EMDR therapy is a three-pronged, treatment approach addressing past, present and future aspects of the presenting problem via an 8-stage treatment process comprising history, preparation, assessment, desensitization, installation, body-scan, closure and re-evaluation. The combined function of these elements is to prepare and support the client through the dual-attention bilateral stimulation process which is the methods defining feature. In stages 1 - 4 the presenting problem is identified and divided into one or more 'targets.' A target is a specific memory contributing to the current problem suitable for EMDR processing. For example, a rape victim might have

Competing interests: None declared. Conflict of interests: None declared.
All authors contributed to conception and design, manuscript preparation, read and approved the final manuscript.
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had previous sexual assaults or abuse that needs to be addressed.

Each of these elements of the memory would be addressed individually in the processing phase of EMDR. Reflecting the four main elements of experience, each target consists of an image, a feeling (plus associated bodily sensations) and a negative thought. The negative thought must be a self-referencing one (e.g.; "I'm weak," "I can't cope.") Safety and stabilization are also emphasized at this stage. In the treatment of PTSD safety might involve addressing any unresolved threats arising out of the trauma or current stressors. In the treatment of pain it might involve addressing threats in the form of pain flare-ups, or vulnerability stemming from decreased physical capacity.

In phases 3-5 (desensitization – body-scan) the therapist guides the client through a series of brief dual attention exercises wherein the client simultaneously focuses on a selected target and simultaneously the bilateral stimulation (bls) in the form of eye-movements, tones or tapping. After each 'set' the client is asked "what do you notice now?" and based upon the response, the therapist guides the next focus of attention and resumes the bls. This process is continued until there is no or minimal disturbance, at which point the best 'positive cognition' is incorporated.

Stages 5 – 8 involve installation of the positive cognition, a body scan, closure and re-evaluation. The 'positive cognition' is an adaptive, self-referencing belief about the client's ability to cope with the memory or the problem (e.g.; "I am strong," "I can cope"). The positive cognition is rated with a VoC (validity of cognition) to ensure that the client really believes it to be true as opposed to just wishful thinking. The body scan is an important element of EMDR therapy where the client is assisted to be aware of any physical sensations that might denote unprocessed emotional distress. Instructing the client to "mentally scan your body for any signs of distress" also helps ensure that any dissociated material or feelings the client is unaware of, are identified and addressed. In the closure stage the session is concluded with the therapist ensuring the client is emotionally stable and then instructing them to keep a record of any upsetting memories or events in-between sessions. These may indicate that there are aspects of the problem that still need to be processed and become the basis for future targets for processing. The next session (stage 8) always begins with a re-evaluation of the targets processed in the previous session, followed by a review of potential targets the client needs to address next.

EMDR treatment of pain involves a number of variations to the standard EMDR trauma protocol including, the option of targeting the pain (as opposed to a memory), themes of control and responsibility/feeling defective in choosing the negative cognition (vs safety and control when working with trauma), the use of auditory bls in treatment and self-use of bls in-between sessions[45]. Because of the slower pace at which changes may occur when working with pain, particularly pain which is not associated with trauma, longer sets of bls are sometimes employed (continuous bls) during which the therapist checks-in with the client without ceasing the bls. These variations reflect the differences between trauma and pain (e.g.; the increased role of physiological factors, the slower rate at which the somatic aspect of the problem changes, the ever-present nature of pain, the disruption to physical functioning, the need to be able to control pain in-between sessions). Auditory bls is preferred because it has been found to reduce pain in fibromyalgia sufferers who were given the choice of visual or auditory bls[46]. Self-use of auditory bls has been reported as helpful in the management of Carpal Tunnel Syndrome[47].

This study sought to investigate the efficacy of EMDR treatment of chronic pain in a general outpatient chronic pain population. It was hypothesized that EMDR would facilitate both reduced emotional distress and reduced pain because of the methods demonstrated capacity to reduce distressing affect in PTSD. It was also hypothesized that treatment gains would be better maintained following EMDR therapy than with traditional methods. It was decided not to adopt a randomized control design (RCT). Although the RCT design is generally viewed as the 'gold standard' for research purposes, it has also been criticized for lacking external validity because of the significant differences between real world clinical practice and RCT design[48,49,50]. Williams and Eccleston have also recommended using alternatives to randomized controlled trails to help better identify factors that contribute to change (e.g., better matching of clients with treatment)[51].

Materials and methods

This work conforms to the values laid down in the Declaration of Helsinki (1964). The protocol of this study has been approved by the relevant ethical committee related to our institution in which it was performed. All subjects gave full informed consent to participate in this study.

In the treatment of chronic pain EMDR therapy involves the creation of reprocessing 'targets' which may be pain-related, trauma-related, or some combination of both. Based on its original incarnation as a treatment for trauma, EMDR targets have traditionally comprised a picture (relating to the traumatic event), negative thought and feeling (including associated bodily sensations) and a SUD's rating. In the treatment of chronic pain where the pain is not trauma-related, the picture may be based on the client's description of their present pain[52]. Other modifications include attention to medical diagnosis, use of continuous auditory bls, and self-use of bls. In EMDR treatment of trauma the accepted practice is to stop the bls to review changes after each set. In EMDR treatment of pain the therapist may conduct this review without interrupting bls. The advantage of this is that it gives the client a more continuous exposure to the bls and, given the refractory nature of chronic pain, a greater chance for the effects of this process to be felt. Each target is processed by assisting the client to focus on it whilst simultaneously

Competing interests: None declared. Conflict of interests: None declared.
All authors contributed to conception and design, manuscript preparation, read and approved the final manuscript.
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attending to the bls. For clients who find this process beneficial, it is continued until they either feel no pain or the changes plateau. At this point a positive cognition (e.g.; "I can control my pain") is installed, again using bls.

Treatment was delivered from a variety of private practice settings in disparate physical locations, based on the decision to collect cases from EMDR-trained therapists in private practice, but also in an attempt to reach a more heterogeneous group of patients, reflecting the varied nature of this problem[53]. In addition to EMDR training, all therapists had to be experienced in the treatment of chronic pain. Five of the 11 cases were treated by the lead author, who has extensive experience in the treatment of chronic pain with EMDR.

Participants

Participants were outpatient adult chronic pain sufferers, suffering from either trauma-related pain (i.e.; arising from a life-threatening event) or pain based on injury. Five of the 11 subjects had a diagnosis of PTSD in relation to their pain and injury (e.g.; two motor vehicle accidents, a fall down a mineshaft, a refugee experience, a skiing accident plus childhood sexual abuse). Another 4 subjects met the diagnostic criteria for posttraumatic stress disorder (based on their responses to the PCL-C) in addition to their medical diagnosis (e.g.; rheumatoid arthritis, spinal injury, peptic ulcer). Most subjects were taking some combination of pain medications or anti-depressants. Patients were accepted into the study on the basis of being assessed as suitable for EMDR therapy after having been referred to an EMDR-trained therapist with specialist training in the application of EMDR to pain. The main criterion for determining a patient's suitability for EMDR is that they do not suffer from a dissociative disorder or Acquired Brain Injury. The duration participants had experienced pain ranged from one to five years.

Outcome Measures

Participants were given a range of self-report tests designed to evaluate the psychological and affective dimensions of their pain problem at the following three points; 1) prior to treatment, 2) after treatment and 3) at 6 months follow-up.

PCL-C. The PCL is a standardized self-report rating scale for PTSD in civilians comprising 17 items that correspond to the key symptoms of PTSD. A diagnosis of PTSD can be made based on a score above 45 (out of a total of 85). Alternatively, a diagnosis can be made by determining whether an individual meets DSM-IV symptom criteria, i.e., at least 1 B item (questions 1-5), 3 C items (questions 6-12), and at least 2 D items (questions 13-17). Symptoms rated as "Moderately" or above (responses 3 through 5) are counted as present[54].

The main component of the Short Form McGill Pain Questionnaire (SF-MPQ) consists of 15 descriptors (11 sensory; 4 affective) which are rated on an intensity scale as 0 = none, 1 = mild, 2 = moderate or 3 = severe. Three pain scores are derived from the sum of the intensity rank values of the words chosen for sensory, affective and total descriptors. The SF-MPQ also includes the Present Pain Intensity (PPI) index of the standard MPQ and a visual analogue scale (VAS). The SF-MPQ has been shown to be a reliable pain measure[55] and sufficiently sensitive to demonstrate differences due to treatment at statistical levels comparable to those obtained with the standard form of this questionnaire[56].

The Pain Disability Index (PDI). 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 behaviour, self-care, and life-support activity (e.g., eating, sleeping, breathing, etc.). The higher the index, (0-70) the greater the pain-related disability will be[57].

The Pain Self-Efficacy Questionnaire (PSEQ) is a 10-item self-report inventory that assesses the strength and generality of a patient's self-efficacy beliefs and his or her confidence to accomplish a range of activities despite chronic pain. Each item is scored on a 7-point Likert scale (ranging from 0 = "not at all confident" to 6 = "completely confident"), with a higher total score indicating stronger self-efficacy beliefs. The maximum possible score is 60[58].

The Beck Depression Inventory, 2 (BDI-II) The BDI-II assesses the intensity of depressive symptoms, responses are summed to give a score range between 0 and 63. The cut-off score for depression is 20 (Borderline clinical depression). A score of 21-30 indicates Moderate depression. A score above 31 indicates severe depression[52]. The BDI-II is an update of the original BDI, which was altered to correspond to criteria from the Diagnostic & Statistical Manual of Mental Disorders (DSM-IV; American Psychiatric Association, 1994). The BDI-2 is a validated, reliable test for depression[59,60].

Process Measures

Two measures, the Subjective units of Distress (SUDS) and the Validity of Cognition (VoC) (EMDR only), were used during the treatment process to measure the patients' response to treatment. SUDS measures were used in this study as a measure of current pain intensity. SUD measures are rated on a Likert scale of 0 (no pain) to 10 (worst pain possible). The VoC ratings were taken during the assessment phase in each session, and represented the strength of the patients' confidence in a desired belief about their ability to cope with their pain. The VoC measures are rated on a Likert scale of 1 (not true) to 7 (completely true). Measures of changes in emotional distress levels were obtained through self-report.

Procedure

Treatment consisted of between 3 and 27 (an average of 10) weekly one-hour sessions, with an EMDR trained therapist with extensive experience with chronic pain. The EMDR therapy sessions were administered according to the authors's treatment manual[47]. This manual integrates the five tasks of the EMDR Chronic Pain Protocol with Shapiro's basic EMDR protocol for traumatic memories[39].

Competing interests: None declared. Conflict of interests: None declared.
All authors contributed to conception and design, manuscript preparation, read and approved the final manuscript.
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As mentioned above, the main differences between the pain protocol and the trauma protocol is the option of targeting present pain (vs. a trauma memory), different themes with the Negative Cognition, use of auditory bls and self-use of bls.

Participants were asked to either remember the trauma that triggered their pain, or to describe their current pain. This was done by instructing the participant to create a mental image of how their pain felt, based on its perceived size, shape, colour etc. Instructing the patient to create an imaginary image of their pain, based on subjective perceptions, is necessary for creating a meaningful "target" for desensitization for those persons whose pain is not associated with a specific traumatic event.

A pain-related negative cognition was elicited. As mentioned above, pain-related Negative Cognitions tend to concern themes of control and responsibility/feeling defective (e.g.; 'I'm helpless', 'there's something wrong with me'). The positive cognition was obtained by asking participants to make a statement about how they would like to feel about their ability to cope with their pain (e.g., 'I can control my pain'). The clients' confidence in their positive cognition was assessed by instructing them to rate the felt validity of the statement on the VoC scale. The participants also rated the severity of their pain using the SUD scale.

Following this assessment, participants were instructed to focus on the pain memory or their present pain while attending to bilateral stimulation and to "just notice" any changes that occurred. At the end of each set, participants were asked "What do you notice now?" When a positive response was made, they were instructed to 'notice that', and further sets of bilateral stimulation were introduced. This was repeated until a satisfactory degree of pain relief was reported.

The subject then was assisted to develop a positive image by being instructed to notice the changes in sensation and think of something that the feelings of relief reminded them of. For example, a feeling of softness might generate an image of a cloud or cotton-wool. This was reinforced with more sets of bilateral stimulations until a reasonably stable set of positive feelings and images were described. Processing continued as long as therapeutic change occurred. Where subjects described "no change" or negative feelings following the bilateral stimulation, prompts in the form of questions and direct suggestions were used to help elicit positive changes.

Treatment was concluded once the participant had achieved a significant reduction in anxiety, depression and pain, and/or appeared to feel confident in their ability manage their pain and distress as measured by the VoC. Maintenance of treatment gains was evaluated via a 6-month follow-up.

Results

Eccleston et al. has speculated that responses to psychological interventions may follow a bimodal pattern, similar to that observed with drugs, where a small proportion of participants respond very well but most change little[7]. On this basis Eccleston et al. argue that it may be more useful to analyse data by the number of individual patients achieving a level of longer-term improvement in pain, disability and distress rather than averaging results. Accordingly, we report both individual results and means for pain, distress and disability at pre-treatment, post-treatment and 6-month follow-up.

Ten of the 11 subjects reported reduced depression upon cessation of treatment. These gains were maintained or improved upon in 4 of the 7 subjects for which follow-up data was available - several subjects had moved without leaving a forwarding address. Of the subjects who did not improve or relapsed, one subject was a traumatized refugee who was in the midst of a prolonged immigration process where a negative outcome would mean she had to return to living with a violent spouse. Another subject relapsed due to deterioration in their medical condition and personal stress (unemployment).

All eleven subjects reported reduced pain upon cessation of treatment. These gains were maintained and/or improved upon in four of the seven for whom follow-up data was available. One of these subjects' pain was of primarily medical origin (rheumatoid arthritis). The same two subjects whose depression scores did not change significantly continued to experience more or less the same levels of pain. Nine of the 11 subjects reported reduced disability on the PDI at post treatment. These gains were maintained or improved upon in all seven of the subjects for whom follow-up data were available.

All eleven subjects reported improved self-efficacy in terms of their perceived ability to control their pain. These gains were maintained or improved upon in five of the seven subjects for who follow-up data were available. The same two subjects who failed to experience or maintain significant improvement on other dimensions failed to maintain their gains here.

Six of the nine subjects whose PCL scores were above the cut-off for PTSD reported decreased PTSD symptoms (sub-clinical) following treatment. All but one of the subjects diagnosed with PTSD no longer met the criteria for PTSD following the treatment. These gains were maintained or improved upon in four of the seven subjects for whom follow-up data were available.

Statistical analysis

The Shapiro-Wilks test was used to determine the normality of the distribution of the data. With the use of Wilks' criterion it was determined that the data collected for post-treatment data for the Short Form McGill Pain Questionnaire was not normally distributed, so this data not been used and the analysis of this measure has been limited to the pre-treatment data and the follow-up data. Analysis determining sphericity of the data was significant for Beck's Depression Index so a paired t-test was used to determine the effect of the three different measurement times, from pre-treatment to post-treatment, and from pre-

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treatment to follow-up. The results of the statistical analysis are summarized in Table 1.

Beck Depression Inventory

The mean of the scores reported from the Beck Depression Inventory reduced from pre-treatment (M = 29.73, SD = 13.37) to post-treatment (M = 19.09, SD = 10.90). A paired t-test showed that this difference was statistically significant (t = 2.84, df = 10, p = .02). The magnitude of the differences in the means (M diff= 10.64, 95% CI: 2.29 to 18.99) was large (d = 0.87). The magnitude of the change for BDI was significant as measured by Jacobson's Reliability Change Index (RCrit = 8.29, M diff = 10.6364)[63]. The Reliability Change Index calculates the standard error of change using the reliability coefficient and the standard deviation to produce a value regarding the likelihood that pre- and post-test change is due to statistical error of treatment. The mean of the scores reported from pre-treatment to follow-up were not significant, although the magnitude of the change was reliable (RCrit = 8.29 M diff = 11.44).

Short Form McGill Pain Questionnaire

The mean of pre-treatment (M = 38.00, SD = 19.74) was higher than the mean at follow-up (M = 22.14, SD = 16.07), and this was statistically significant (t = 3.754, df = 6, p < .01). The magnitude of difference between these was large (M diff = 15.86, 95% CI: 6.61 to 31.39, d = 1.575). The Reliability Change Index indicated that there was a reliable change between the two means (RCrit = 12.24, M diff = 15.86).

Pain Disability Index

A one-way within-subjects ANOVA was conducted on Pain Disability Index scores. There was a statistically significant effect of the measurement time (F [2,12] = 24.101, p < .01, partial η^2 = .801). A significant linear trend emerged (F[1,6] = 39.255, p < .01). A paired t-test indicated that the means of pre-treatment (M = 56.45, SD = 12.50) and post-treatment (M = 28.82, SD = 14.63) were significantly different (t = 5.81, df = 10, p < .01). Cohen's d-statistic indicated the magnitude of difference was large (M diff = 27.64, 95% CI: 17.04 to 38.23, d = 1.763). The Reliability Change Index indicated that there was a reliable change between the two means (RCrit = 7.75, M diff = 27.64). Pre-treatment scores were significantly different to follow-up scores (follow-up mean = 20.29, SD = 12.82, t =6.265, df = 6, p < .01). The magnitude of difference was large (M diff = 36.17, 95% CI: 22.72 to 51.85, d = 2.071) and the Reliability Change Index indicated that the change was reliable (RCrit = 7.75, M diff = 36.17).

Pain Self Efficacy Questionnaire

A one-way within-subjects ANOVA concluded that there was a statistically significant effect of measurement time (F [2,12] = 4.344, p = .04, partial η^2 = .420), as well as a significant linear trend (F[1,6] = 19.267, p < .01). Paired t-tests indicated significant differences between the two means (Pre M = 17.00, SD = 11.33, post M = 29.73, SD = 14.30; t = -2.789, df = 10, p = .02). The magnitude of difference was large (M diff = 12.73, 95% CI: -22.72 to -2.57, d = 0.852) and the magnitude of change was reliable (RCrit = 7.02). Pre-treatment scores were also smaller than the follow-up scores (M = 32.57, SD = 8.56) and significantly different (t = -4.389, df = 6, p < .01). Again the magnitude of difference was large (M diff = 15.57, 95% CI: -26.48 to -7.52, d = 1.585) and reliable (RCrit = 7.02)

PTSD Checklist

Analysis showed that there were significant effects of

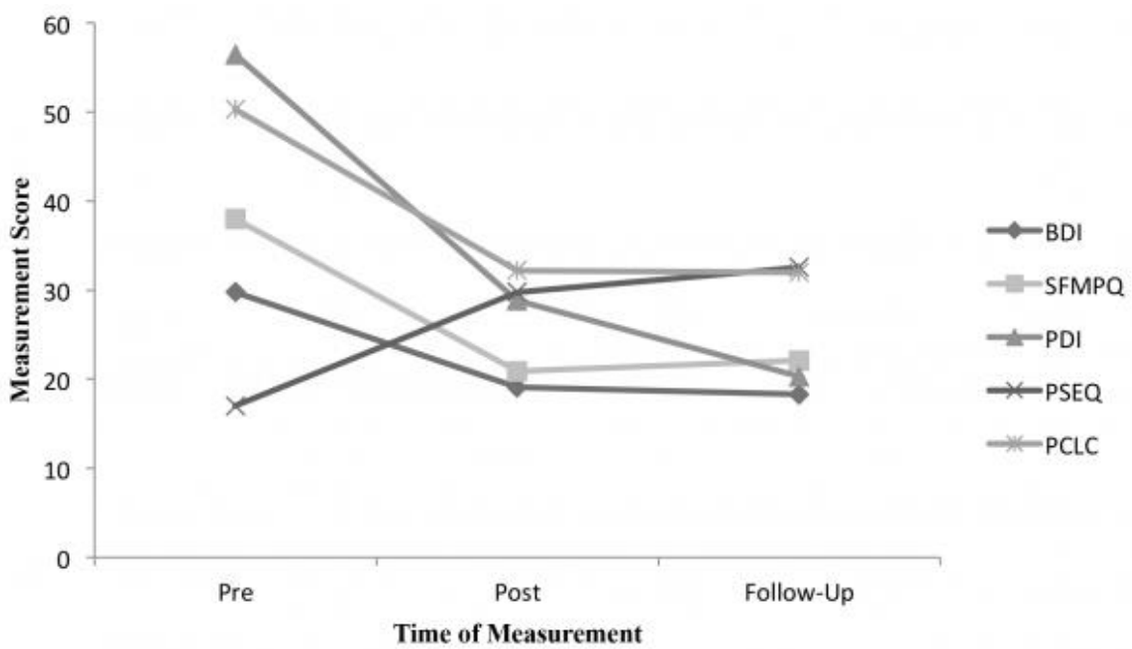

Figure 1: Overall decrease in pain and distress following EMDR treatment.

Competing interests: None declared. Conflict of interests: None declared.
All authors contributed to conception and design, manuscript preparation, read and approved the final manuscript.
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Table 1: Statistical Summary.

	Mean difference	t statistic	p	Cohen's d	RCrit
BDI pre-post	10.64	2.84	0.02	0.869	8.29
BDI pre-follow-up	11.44	1.046	0.34	0.614	8.29
SFMPQ pre-post	17.09	6.695	<0.01	2.225	12.24
SFMPQ pre-follow-up	15.86	3.754	<0.01	1.575	12.24
PDI pre-post	27.64	5.81	<0.01	1.763	7.75
PDI pre-follow-up	36.17	6.265	<0.01	2.071	7.75
PSEQ pre-post	12.73	-2.789	0.02	-0.852	7.02
PSEQ pre-follow-up	15.57	-4.389	<0.01	-1.585	7.02
PCLC pre-post	18.09	4.584	<0.01	1.469	10.88
PCLC pre-follow-up	18.27	4.681	<0.01	0.848	10.88

measurement time (F [2,12] = 19.550, p < .01, partial η^2 = .765), as well as a significant linear relationship (F[1,6] = 21.912, p < .01). Checklist pre-treatment scores (M = 50.27, SD = 17.56) were higher than post-treatment (M = 32.19, SD = 12.64) and this was significant (t = 4.584, df = 10, p < .01). Cohen's d indicated that the magnitude of difference was large (M diff = 18.09, 95% CI: 9.30 to 26.89, d = 1.469) and reliable (RCrit = 10.88). Pre-treatment scores were also significantly larger than follow-up scores (M = 32.00, SD = 11.17; t = 4.681, df = 6, p < .01). The magnitude of difference was large (M diff = 18.27, 95% CI: 11.93 to 38.07, d = 0.848) and reliable (10.88). Figure 1 summarizes the above results in graphic form.

Discussion

The results of this study indicate that EMDR therapy can be effective in the treatment of chronic pain and its effects in a heterogenous group of pain sufferers. Although most of the research regarding EMDR treatment of pain points to it being more effective with pain which is associated with trauma, Gerhardt et al. have suggested that EMDR might prove to be effective in patients with high emotional distress but without a history of trauma because of the many similarities between chronic pain and trauma[62]. Significantly, six of the nine subjects with clinical levels of PTSD symptoms and pain experienced a reduction in both PTSD symptoms and pain. However, all subjects in this study reported decreased pain following EMDR therapy. Treatment gains were well maintained in the absence of confounding factors such as medical complications, major stressors.

Statistically significant improvements were obtained for depression, pain and disability, PTSD symptoms and pain efficacy, relative to baseline, after an average of 10 sessions of treatment. The finding that participants reported significantly decreased pain and disability is noteworthy and consistent with other research reports regarding this method. Although this study involved a small sample size, the number of participants who maintained their treatment gains at follow-up was greater than what would be expected from traditional psychological approaches. The finding that for many subjects improvements were maintained after cessation of treatment, without the need for extensive homework (e.g.; pain logs, activity schedules, relaxation exercises) indicates that less out of session effort is required by the patient to maintain treatment gains than with traditional methods. This is consistent with reviews of EMDR treatment of trauma[13]. Another advantage of reduced reliance on homework is that patients are generally poor at adhering to it. This finding also lends support to the claim that EMDR therapy works by altering pain memories, as it appears to with traumatic memories and as predicted by the AIP model.

The amount of treatment required varied considerably for each subject. Two of the eleven subjects (both sufferers of simple PTSD) required less than 5 sessions, while one case involving both present and past trauma required over 20 sessions. The range of responses and treatment needs received indicates that the presence of unresolved physical injury, on-going invasive medical treatment and/or other major life stressors increases the need for psychological treatment and limits what can be achieved. This is consistent with Shapiro's notion that effective treatment is not possible in the absence of safety (where medical complications and major life stressors are regarded as 'threats')[63]. The finding that pain persisted in some cases is in contrast to treatment outcomes regarding EMDR treatment of phantom limb pain, where complete and permanent resolution of the pain has been reported[23,24]. This would seem to support the notion that EMDR therapy is most effective with pain which is primarily trauma-based. Notwithstanding this, three subjects whose pain was primarily medical in origin reported a significant decreased in pain and distress following this treatment, with treatment gains maintained at follow-up for the one subject for whom follow-up data were available.

A number of variations to the standard EMDR trauma protocol were employed, including auditory bls, 'continuous bls' and self-use of bls. These variations were well-accepted by subjects and did not seem to detract from the methods efficacy. Given the overall results their use seems justified.

EMDR therapy, information processing and the brain

EMDR's unique theoretical model represents a response to the Eccleston et al.[7] call for new hypotheses about change. In a review of the role of the stress system in chronic pain

Competing interests: None declared. Conflict of interests: None declared.
All authors contributed to conception and design, manuscript preparation, read and approved the final manuscript.
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Melzack notes, "Decreases in stress and manipulation of the HPA component of the stress system are likelier to produce pain relief … than traditional lines of therapy"[64]. Price has suggested that effective treatment of pain should stimulate "changes in the patient's cognitive and/or affective experience which activate thalamospinal nociceptive inhibitory fibres that modify the sensory discriminative dimension of pain."[65] Fuchs has outlined a brain-based model of psychotherapy incorporating a blend of 'top-down' (e.g., subjective mental acts) and 'bottom-up' (e.g., pharmacological effects on subcortical transmitter metabolism) inputs. According to this model there is no separation but rather a mutual transformation of psychological into biological processes and vice versa, brought about by the brain[66]. Based on its different theoretical and methodological components, EMDR would seem to constitute a treatment approach which is more consistent with current understanding of human information processing. For example, the finding that bls is an integral part of EMDR therapy and that the method stimulates changed activity in physiological stress indicators such as heart rate and skin conductance in PTSD sufferers suggests that the bls element of EMDR therapy constitutes a peripheral 'bottom-up' input which serves to alter the sensory-emotional dimension of the problem. When this is combined with 'top-down' processes such as focused attention and cognitive re-evaluation, the patient's experience of both the problem and their ability to cope is altered. Others have suggested that EMDR therapy decreases pain sensations by enhancing interhemispheric communication and cortical integration of traumatic memories[32]. The idea that EMDR therapy is facilitating more coordinated interhemispheric activity is also consistent with current models of brain functioning if we consider Gazzaniga's view that the right hemisphere is primarily associated with sensory processing while the left hemisphere is primarily associated with mental processes[67]. While all psychotherapies alter brain functioning through some combination of mental and experiential elements, the pairing of these elements in EMDR seems to be more congruent with contemporary understandings of brain structure and functioning.

The future of EMDR therapy as a treatment for pain

In addition to being consistent with the central sensitization theory of pain, the AIP model also marries well with recent discoveries regarding the role of brain processes in memory processing and re-consolidation. Namely that repeated experiences of pain lead to the development of 'maladaptive' pain memories similar to those associated with trauma. EMDR treatment of pain seems to facilitate the processing and desensitization of pain-related etiological events, which may be traumatic events related to the pain or the pain experience itself. The method is also consistent with calls for treatment strategies which incorporate information processing aimed at desensitizing the peripheral and central nervous systems.

EMDR therapy is an integrative psychotherapy which incorporates a unique blend of elements from CBT, psychoanalysis and mindfulness, plus bls. Given the recent findings regarding the physical and emotional effects of bls, and that it does contribute to treatment effects following EMDR therapy, it seems likely that bls might be responsible for some of the unique outcomes reported in this study. Consistent with this, many of the subjects reported increased relaxation and decreased pain following bls; effects which were retained on a relatively permanent basis in some subjects. Moreover, most subjects reported finding self-use of audio bls (PRN) helpful for alleviating their pain in-between sessions. While more research is needed to ascertain what sort of patients can safely benefit from self-use of bls, it appears that this element of EMDR might offer a novel and easy way to help chronic pain sufferers manage their pain.

A recent meta-analysis concluded that EMDR may be a safe and promising treatment option in chronic pain options, but that the small number of high quality studies limits the ability to make definite treatment recommendations[4]. While this study suffers from methodological weaknesses such as a small sample size and lack of a control group, it does add to the growing database regarding this method's applicability to pain and hopefully will stimulate the creation of more controlled studies.

Conclusion

This study adds to the growing literature regarding EMDR therapy treatment of chronic pain. Treatment gains following EMDR were substantial for all aspects of the pain experience and appeared to be well maintained in the absence of significant medical and psycho-social stressors. Consistent with other findings, this study also demonstrates that the method may be most effective with chronic pain sufferers whose pain is associated with high levels of emotional distress. As with EMDR treatment of PTSD, treatment outcomes appeared to require significantly less homework.

The inclusion of self-use of auditory bls as a pain-control strategy is an innovative aspect of this application of EMDR therapy which offers promise for chronic pain sufferers whose pain is not adequately resolved following EMDR treatment. More research is needed to evaluate the efficacy of this innovation for different groups of chronic pain sufferers (eg; pain associated with PTSD vs. pain not associated with PTSD).

The generalizability of the study results are limited by the small number of subjects, and the non-randomization of treatment. Nevertheless, if these types of change are possible, even for just a proportion of pain sufferers, then EMDR therapy represents a promising new approach to treating chronic pain and a worthy response to Eccleston's call for new theories and approaches to pain. EMDR therapy for pain urgently needs some controlled research. It is hoped that this study and others like it will stimulate greater interest in EMDR therapy as a treatment for pain.

Competing interests: None declared. Conflict of interests: None declared.
All authors contributed to conception and design, manuscript preparation, read and approved the final manuscript.
All authors abide by the Association for Medical Ethics (AME) ethical rules of disclosure.

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Competing interests: None declared. Conflict of interests: None declared.
All authors contributed to conception and design, manuscript preparation, read and approved the final manuscript.
All authors abide by the Association for Medical Ethics (AME) ethical rules of disclosure.

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Competing interests: None declared. Conflict of interests: None declared.
All authors contributed to conception and design, manuscript preparation, read and approved the final manuscript.
All authors abide by the Association for Medical Ethics (AME) ethical rules of disclosure.

FOR CITATION PURPOSES: *Grant MD. Eye movement desensitization and reprocessing treatment of chronic pain. OA Musculoskeletal Medicine 2014 Aug 17;2(2):17.*

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Competing interests: None declared. Conflict of interests: None declared.
All authors contributed to conception and design, manuscript preparation, read and approved the final manuscript.
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