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# Eye movement desensitisation and reprocessing in chronic pain conditions

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## Abstract

### Introduction

Chronic pain is prevalent and associated with a high disease burden. However, current treatments for chronic pain provide insufficient relief. Therefore, the exploration of new treatment methods is warranted. Originally, Eye Movement Desensitisation and Reprocessing (EMDR) developed as a treatment approach for post-traumatic symptoms (e.g. post-traumatic stress disorder), and shows promising results in the treatment of chronic pain conditions. This paper is a critical review of pertinent articles concerned with the feasibility and usefulness of EMDR in the treatment of chronic pain.

### Method

Articles on EMDR were retrieved selectively by searching regular literature. This review summarises the findings from EMDR studies conducted for the treatment of chronic pain and also extracts potential theories that may explain the reason why EMDR is a promising treatment for chronic pain conditions. In this review, findings and theories regarding the use of EMDR have been discussed, and the implications for research have been derived.

### Results

Early reports show that EMDR either significantly reduces the intensity of pain or completely eliminates chronic pain in various pain

conditions, including phantom limb pain, fibromyalgia and migraine. Several underlying mechanisms are discussed, including the Adaptive Information Processing model and neurobiological mechanisms.

### Discussion

The early findings should be interpreted carefully because they are based on reports with methodological limitations. These include the use of small sample sizes, heterogeneous samples and missing control groups that are discussed in this critical review. Moreover, some of the challenging questions remain unexplained, such as the focus of EMDR treatment, its dose-response relationship and its safety. It is observed that not all patients respond to the EMDR treatment, which makes it difficult to identify appropriate subgroups of chronic pain patients.

### Conclusion

There is early evidence that EMDR treatment is successful in reducing chronic pain, but further research is required to account for the limitations of the findings observed in this critical review.

## Introduction

Chronic pain is common and shows a high socioeconomic relevance<sup>1</sup>. However, most treatment approaches are characterised by a lengthy duration, high costs and only low-to-moderate effects<sup>2-4</sup>. Given this relatively modest treatment efficacy and the high social and economic costs of this condition, the exploration of new treatment methods is warranted in future studies.

With respect to the treatment of chronic pain, the lack of positive effects might be a result of the non-specific nature of the treatments

being used for a heterogenic group of chronic pain patients. Thus, some chronic pain patients will respond to a particular treatment, while others will not. Therefore, almost a decade ago, development of subgroup-specific treatments was suggested<sup>5</sup>, but this remains a neglected issue in the research of chronic pain.

In this review, one subgroup of chronic pain patients corresponds to patients experiencing high emotional distress, e.g. pain caused by psychological trauma (often reported in chronic pain<sup>6</sup>) and/or chronic pain itself.

Recent studies show some evidence that Eye Movement Desensitisation and Reprocessing (EMDR), a treatment that targets emotional distress and the associated physical symptoms, can successfully reduce pain, in addition to trauma-related symptoms<sup>7</sup>. Therefore, EMDR might prove to be a promising approach in patients with high emotional distress, but without a history of trauma because there are manifold commonalities in patients with trauma-related symptoms and chronic pain<sup>8-10</sup>. Early studies support this assumption and show evidence that EMDR treatment could also benefit patients with chronic pain without a history of trauma<sup>11</sup>.

The mechanisms that underlie the effectiveness of EMDR in chronic pain are still uncertain and controversial because there are several possible explanatory models. The aim of this critical review is to discuss EMDR in chronic pain conditions.

## Methodology

This paper is a critical review of pertinent articles concerned with the feasibility and usefulness of EMDR in

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the treatment of chronic pain. These articles were retrieved by regular selective literature searches that contained the terms 'Eye Movement Desensitisation and Reprocessing', 'EMDR' and 'pain'. This review summarises the findings of EMDR for the treatment of chronic pain and also extracts potential theories that may explain the reason why EMDR is a promising treatment for chronic pain conditions. Findings and theories regarding the use of EMDR have been discussed in this review; and the implications for future research have also been derived.

### What is EMDR?

In the late 1980s, Dr. Francine Shapiro, an American psychologist, was the first to develop EMDR, as a result of a chance observation. Shapiro noticed that while thinking about a traumatic memory, voluntary eye movements are capable of reducing the intensity of the associated emotional distress. As a result, EMDR therapy was initially developed as a treatment for post-traumatic symptoms<sup>12</sup>.

In EMDR therapy, after the patient gets stabilised and existing resources are activated, the patient is instructed to concentrate on a disturbing negative traumatic memory and the associated emotional, cognitive and physical elements while focusing on an external bilateral stimulus. For bilateral stimulation, the therapist's finger typically moves back and forth in front of the patient's face, thus stimulating the bilateral eye movements. Alternatively, bilateral tapping or some other bilateral stimulus, such as bilateral auditory tones, can be used for the EMDR therapy.

Based on this procedure, EMDR offers a comprehensive treatment approach wherein the patient can be exposed to unresolved memories and distress from their negative experiences in a controlled manner, without feeling overwhelmed by the physical or emotional symptoms. This leads to the creation of a sense

of self-mastery, which allows integration of the disturbing memory in a more adaptive way; thus, self-esteem and new coping strategies have been established. It is observed that EMDR is purported to induce relaxation in hyperarousal<sup>13</sup> and has become an evidence-based first-line treatment for the post-traumatic symptoms<sup>14-16</sup>.

Due to the many similarities among patients with trauma-associated symptoms and chronic pain<sup>8-10</sup>, EMDR can most likely be adapted for treating chronic pain patients. Considering the association between chronic pain and trauma-related symptoms, a model of shared vulnerability and mutual maintenance is discussed here. This model proposes that the physiological, affective and behavioural components of post-traumatic stress disorder (PTSD) maintain and exacerbate symptoms of pain and that the cognitive, affective and behavioural components of chronic musculoskeletal pain similarly maintain or exacerbate symptoms of PTSD. Some of these factors are expected to constitute a shared vulnerability<sup>8-10</sup>.

Therefore, EMDR is expected to alter the patient's cognitive, affective and somatic symptoms and enable the patient to identify inner resources that can provide pain relief<sup>17</sup>. Furthermore, EMDR has been found to improve pain coping abilities and to facilitate relaxation abilities that finally results in the reduction of pain and pain-related attitudes and beliefs.

### Potential underlying mechanisms

Although there is evidence that EMDR is effective and useful for the treatment of chronic pain, the underlying mechanisms still remain unclear. Accordingly, various theoretical models have been proposed to account for EMDR's underlying mechanisms of action. The most elaborated model and neurobiological mechanisms are illustrated below.

### The Adaptive Information Processing model

Although the Adaptive Information Processing (AIP) model was originally described with respect to trauma<sup>13</sup>, this model can be expanded to treat patients with chronic pain. According to the AIP model, experiences are stored in a neural network and include physical sensations, automatic emotional responses, thoughts and beliefs. Under healthy conditions, these experiences are processed and associated with relevant stored information and then integrated into a large network of prior experiences. It has been suggested that traumatic events or pain experiences can upset the information processing system, thus, such events or experiences are not adequately processed. As a result, they are processed in a state-specific and dysfunctional form and stored in isolation instead of being integrated 'adaptively' into the existing network. As a consequence, trauma-related symptoms (e.g. disturbing memories, hyper-arousal and flashbacks) develop<sup>12,13</sup>. With respect to pain, such experiences can be a traumatic event (e.g. an accident, an illness or medical procedures) or long-lasting pain itself that finally results in a 'non-adaptive' pathological neuronal state.

The neural network of such inadequately stored experiences can then be re-activated when only some of its elements are triggered (e.g. related physical sensations, disturbing emotions, thoughts or beliefs). Accordingly, previous traumatic or painful memories may lead to an augmented pain response to future stimuli, even though these stimuli are not painful in nature<sup>13</sup>.

EMDR is thought to stimulate the information processing system in a healing manner, and thus promoting psychological health. EMDR facilitates reprocessing and integration (learning) by linking disturbing thoughts, emotions and bodily sensations through associations with the

relevant information. Therefore, first the experience must be interpreted and then stored appropriately through adaptive assimilation into comprehensive memory networks. Such processing results in the transfer of information from implicit to explicit memory systems<sup>13</sup> that no longer contain the disturbing affects and sensations. Therefore, the treatment of pain with EMDR incorporates the processing and desensitisation of pain-related etiological events, along with the disturbing effect and body sensations associated with the pain. The AIP model can also be expanded to treat patients with chronic pain without etiological events<sup>13,17</sup>.

#### Neurobiological mechanisms

Recent brain research demonstrates that 'there are now neurochemical explanations, i.e. kindling, neuroplasticity, limbically augmented pain syndrome, etc., that can properly account for the patient's degree of suffering' (p. 203)<sup>18</sup>. Authors also state that such explanations are congruent with Shapiro's AIP model<sup>18</sup>.

One interesting theory that is discussed here is the 'lateralisation hypothesis'. This postulated mechanism targets inter-hemispheric and intra-hemispheric interactions during pain processing. High levels of emotional arousal are thought to be linked with over-activation of the right hemisphere. For example, right-cerebral activation is reported in response to noxious stimuli and appears to be associated to the right hemisphere's role in experiencing negative emotions and processing aversive events, such as pain<sup>19</sup>. According to this theory, EMDR treatment could help decrease or eliminate pain sensations by enhancing the inter-hemispheric communication and the cortical integration of traumatic memories. As a result, there may be a decrease in negative emotional arousal with a concomitant reduction in hypervigilance, which may also lead to

a decrease in pain perception<sup>19</sup>. Furthermore, bilateral stimulation in EMDR has been found to induce a relaxation response<sup>20</sup>. This response probably allows the release of natural opiates, which leads to the amelioration of symptoms and body sensations when combined with inhibition of amygdala<sup>17,20</sup>.

Another mechanism discussed here targets the limbic system. It has been hypothesised that a distinct effect of EMDR treatment may be desensitising for the limbically augmented portion of the pain experience<sup>18,21</sup>. According to this theory, the EMDR-induced central alterations result in the increased activation of the anterior cingulate cortex and the left prefrontal area, enabling the capacity of higher-brain functions to override input from limbic structures<sup>19,20</sup>. This activation facilitates a limbic down-regulation, reduces kindling and enhances the integration of thalamic, amygdaloid, hippocampal and cortical functioning<sup>20</sup>.

#### Results

##### EMDR in chronic pain conditions

In recent years, early findings about the use of EMDR in chronic pain have been published that focus on different pain conditions.

Majority of the publications have used EMDR to treat phantom limb pain (PLP). Case series report significant reductions or even the complete elimination of PLP<sup>22-24</sup>, even after follow-up<sup>22,23</sup>.

EMDR was also used in treating patients with fibromyalgia (FMS). A case report found reduced pain intensity, even six months after the treatment<sup>25</sup>.

EMDR was also applied in chronic recurrent migraine. In this case, there was a decrease in headache frequency and duration, but no reduction was found in pain intensity<sup>26</sup>. An integrated EMDR approach applied in acute migraine (together with diaphragmatic breathing and cranial compression) versus treat-

ment with standard medication, reported reduced pain levels immediately and through seven days of follow-up in both the treatment groups. However, the pain reduction by EMDR was found to be more rapid and significantly greater<sup>27</sup>.

There have also been reports concerning the use of EMDR in mixed chronic pain samples. A study in mixed chronic pain patients (79% patients with headache, 10.5% patients with FMS and 10.5% patients with neuropathic pain) experienced a significant decrease in pain sensations<sup>21</sup>. Another study utilised a one-session EMDR treatment in 17 patients with Diagnostic and Statistical Manual Fourth Edition (DSM-IV) chronic pain disorder. It was found that there was a decline in the pain intensity, but this decline was not significant. However, observation of significant effects after only one session would be unlikely<sup>28</sup>.

Although studies have reported a decline in pain intensity, this has not been the case in all the patients. Therefore, subgroups of patients for whom EMDR is successful should be identified. This might be accomplished by considering the potential mechanisms that are involved in EMDR treatment.

#### Discussion

In this review, the authors have referenced some of their own studies. These referenced studies have been conducted in accordance with the Declaration of Helsinki (1964) and the protocols of these studies have been approved by the relevant ethics committees associated to the institutions in which they were performed. All human subjects, in these referenced studies, gave informed consent to participate in the studies.

##### Effects of EMDR in chronic pain conditions

The reviewed studies showed that EMDR treatment is effective in reducing pain. Although these results are promising, the data should be

interpreted with caution because many study limitations are evident. These include small sample sizes (usually <10), heterogenic sample selection and the absence of control groups. Future research would benefit from larger and more homogeneous samples and the inclusion of appropriate control groups.

Additional questions are raised by these early studies. One important question challenges the identification of appropriate subgroups for EMDR treatment. Although the reported effects were promising, the more pronounced effects seem to be observed in PLP than in mixed chronic pain samples<sup>11</sup>. A possible explanation is that PLP is most often a trauma-associated symptom, and EMDR was initially used as a treatment for trauma-related symptoms. This would also suggest that EMDR may be especially useful in treating military personnel who suffer from trauma-associated symptoms and chronic pain as a result of combat-related injuries. Nevertheless, not all patients could be considered as responders (meaningful clinical improvement) to this treatment.

The direct and indirect effects of EMDR treatment must be clarified, as it is possible that the reduction in pain is only an indirect effect of the reduction of trauma symptoms. However, the mixed chronic pain groups were too heterogeneous to state this conclusively. Therefore, it is necessary to separate the subgroups of patients who demonstrated meaningful clinical improvement from EMDR compared with those patients who did not adequately respond to this treatment. This also challenges research work on the underlying pathophysiological mechanisms and how these mechanisms might be affected by the EMDR treatment. The mechanisms reviewed in this critical review should be validated in chronic pain conditions in different subgroups of patients (e.g. with and without co-morbid trauma). This could assist the use of mechanism-

based diagnostic procedures to assign patients to the appropriate treatment groups. Another issue observed is the dose-response relationship. Previous studies used 1 to 15 EMDR sessions. All of these studies were able to show the positive effects of EMDR treatment. The question, however, is how much treatment is necessary to show meaningful clinical effects that remain constant at follow-up. Another question challenges the primary target of this treatment. Most often, EMDR has been used in traumatised patients with chronic pain (e.g. PLP). Some studies focused on the experienced trauma, while others focused on the chronic pain. Thus, whether the traumatic experiences or the chronic pain should serve as the primary focus is yet to be determined. Another question that arises is whether EMDR is a promising approach in patients experiencing high emotional distress from pain but who have not yet experienced prior trauma. A further issue of interest is the safety of EMDR in traumatised chronic pain patients in whom both trauma and pain are associated. In such patients, EMDR should reduce the pain and trauma-related symptoms without re-traumatisation and the deterioration of the symptoms.

### Conclusion

There is early evidence for the usefulness of EMDR treatment in chronic pain conditions. The data for these conditions must be considered as preliminary because our research raised has many questions with respect to the utility of EMDR. Therefore, studies with appropriate sample sizes and distinct samples are necessary to confirm these early findings. Future studies should also include control groups to confirm that the observed positive effects are not just the results of passage of time. Subgroups should be identified to distinguish between patients who benefit and patients who do not benefit from the EMDR treatment. This subgroup stratification

might be assisted by the identification of the pathophysiological mechanisms involved in chronic pain and the effects of EMDR treatment. The most challenging question might be whether EMDR is appropriate for patients with high emotional distress caused by chronic pain that does not report a history of psychological trauma.

### Abbreviations list

AIP, Adaptive Information Processing; EMDR, Eye Movement Desensitisation and Reprocessing; FMS, fibromyalgia; PLP, phantom limb pain; PTSD, post-traumatic stress disorder.

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