

Methodological Aspects of Cognitive Rehabilitation with Eye Movement Desensitization and Reprocessing (EMDR)

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ABSTRACT

A variety of nervous system components such as medulla, pons, midbrain, cerebellum, basal ganglia, parietal, frontal and occipital lobes have role in Eye Movement Desensitization and Reprocessing (EMDR) processes. The eye movement is done simultaneously for attracting client's attention to an external stimulus while concentrating on a certain internal subject. Eye movement guided by therapist is the most common attention stimulus. The role of eye movement has been documented previously in relation with cognitive processing mechanisms. A series of systemic experiments have shown that the eyes' spontaneous movement is associated with emotional and cognitive changes and results in decreased excitement, flexibility in attention, memory processing, and enhanced semantic recalling. Eye movement also decreases the memory's image clarity and the accompanying excitement. By using EMDR, we can reach some parts of memory which were inaccessible before and also emotionally intolerable. Various researches emphasize on the effectiveness of EMDR in treating and curing phobias, pains, and dependent personality disorders. Consequently, due to the involvement of multiple neural system components, this palliative method of treatment can also help to rehabilitate the neuro-cognitive system.

Key Words:

Rehabilitation,
 Eye Movement,
 Desensitization,
 Reprocessing.

1. Introduction

In 1989, a hypothesis was suggested that eye movement has desensitization effects (Shapiro, 1989). This was also tested on different persons and similar results were found. Later on, some other elements were added to this intervention which involved cognitive components and a method of treatment so called Eye Movement Desensitization (EMD) (Shapiro, 1998). The development and accomplishment of this treatment method continued; its name changed into "Eye Movement Desensitization and Reprocessing" (EMDR) in order to reflect the cognitive and attitudinal changes associated with illness which occurs during the treatment (Shapiro, 2001; Barrowcliff, 2001).

The adaptive information processing model is an information processing theory for defining and anticipating the therapeutic effects of EMDR (Brom, 1989; Brown, & Shapiro, 2006). All human beings have an information processing system which is comparable with other systems of the body. The information processing system processes the multiple elements of our experiences and stores the memories in an accessible and useful way (Bower, 1981; Davidson et al., 2001). The memories are stored in networks which consist of thoughts, images, emotions, and related sensations; these networks are adaptively connected with each other. The learning occurs when the new associations parallel with the previously stored materials (Stickgold, 2002). When a negative or traumatic event takes place, the information processing maybe done imperfectly due to the negative

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emotions or the interference of emotional dissociation with those processing. As a result, new information does not make an appropriate connection with the more adaptive information which is stored in memory networks (De Jongh et al., & Foa et al., 1998). EMDR can be helpful for clinical relief from agonizing memories by reprocessing the components. This could involve major or minor traumatic memories. The information processing is done through making adaptive connection between previous memories and traumatic ones (Andrade et al., 1997). During this treatment, learning occurs and new experience with the associated emotion is stored in the individual's memory and prepare him/her for the proper reaction in the future situation (Chemtob et al., 2000). The EMDR and behavior therapy methods along with pharmacologic interventions are considered a palliative treatment. The EMDR is more effective than behavior therapy and its effects are obtained in a shorter time (Keane et al., 1989; Van Etten et al., 1998; Foa, & Rothbaum, 1998). Various studies show the stability of the EMDR effects during the time. In a study, the war survivors who participated in a course of treatment (12 sessions) showed therapeutic effects after 9 months (Carlson et al., 1998). An investigation on gradual studies of therapeutic effects of EMDR shows that just one course of treatment (in comparison with limited treatments) could be insufficient for the complete improvement of the disorder.

2. Mechanism of Action

Although the eye movement is the most distinct characteristic of the treatment, the EMDR is not a simple process and eye movement is not its only main component. There are rather various components associated with its therapeutic effect. The eye movement is used to draw the client's attention to an external stimulus while the client is simultaneously concentrating on the internal agonizing subject (Andrade et al., 1997; Bae et al., 2008; Kuicken et al., 2001). The eye movements (EMs) are defined as dual attention stimuli which convey a trend during which the client concentrates on both internal and external stimuli. The eye movement with the therapist's guide is the most common dual attention stimulus used, but there are many other forms of stimuli like hand-tapping and auditory stimulation that can be used in this treatment method (Shapiro, 1995; Lee et al., 2006; Kavanagh et al., 2001). The role of eye movement has been already documented in relation to cognitive process mechanisms. A collection of systematic experiments have revealed that the eye's spontaneous movement is associated with cognitional changes and

unpleasant emotions (Williams et al., 1997; Spector, & Read, 1999; Gunter, & Bonder, 2008). The question at hand is that how the eye movement along with other stimuli has an effect in the treatment's outcome. Studies designed with the purpose of comparing EMDR (with eye movement) and EMDR without eye movement indicate that the eye movement causes a decrease in arousal, flexibility in attention and memory processing, and improvement of semantic recalling (Foa et al., 1989; Engelhard et al., 2010).

In some studies, it has been noticed that the eye movement decreases the vividness of the memory images and also the accompanying arousal. The eye, in order to focus voluntarily and fixate the object, stores vivid images from moving object, focuses on near or far objects, and needs complete coordination of muscles and also three sets of intraocular muscles (ciliary muscles, dilators, and iris sphincters) (Barrowcliff et al., 2004). The neural mechanisms which direct these functions are in medulla, pons, mid brain, cerebellum, basal ganglia, parietal, frontal, and occipital lobes. The precise binocular vision is reached by coordinated function of ocular muscles which allow a visual stimulus that is on the similar parts of the two retinas. The simultaneous and symmetrical movements of the eyes are called conjugate movement or gaze (Barrowcliff et al., 2004; Brown et al., 1997). The simultaneous movement of the eyes in opposite directions to each other which happens in convergence with the eyes is called disconjugate. These two natural types of eye movement are called version and vergence, respectively. The movement of the eyes in horizontal axis could be saccadic or in form of slow pursuing movements. The purpose of saccadic movements is rapid changing of visual fixation in order to bring new images of objects on the fovea. The saccadic movement can be made by asking the client during the examination (Kuicken et al., 2001-2002; Parker et al., 2009). Command saccades are slower pursuing eye movements and its purpose is to store a clear and stable image from a moving object. The brain circuits for soft/slow pursuit movement are less known. One of the routes is probably rooted from the posterior parietal cortex, adjacent temporal and anterior occipital cortex and descends into dorsolateral pons core on the other side. Also, some papillae from frontal eye field and dorsolateral pons core on the other side and papillae from flocus and cerebellum dorsal vermis are involved in it (Kuicken et al., 2001-2002; Lee et al., 2006; Parker et al., 2009). In addition to the routes mentioned above, during the EMDR, the sensory circuits are involved in the optical nerve to optic chiasm after formation of optical tract through optic radiation which moves towards

the occipital cortex. In order to preserve the proper tone of pupil and adjusting the entering light, the afferent visual routes from retina toward pretectal cores of mid brain and constricting routes of pupil from mid brain towards the retina are involved.

3. Technical Considerations

The EMDR, by combining the effective psychotherapy elements in treatment, presents the maximum therapeutic effects. These psychotherapies consist of psychodynamic, cognitive-behavioral, interpersonal, empirical, and body-centered approaches. EMDR is a treatment method for processing of information and uses an 8 phase approach for treatment (Shapiro, 2002a) (Figure 1). During this method, the client accompanies his/her present and previous experiences in different doses consecutively, while simultaneously concentrating on an external stimulus. Then the client is ordered to consider new elements for the next series of dual attention. This succession of dual attention and personal association is repeated through the treatment session in attention and memory problems (Shapiro, 2002b; Lee et al., 2006).

3.1. Diagnosis (1st phase)

The first phase in EMDR treatment is taking an initial history during which the therapist evaluates the client and designs a treatment plan (Verder, 2002). The therapist and client both consider the probable aims of treatment which consists of agonizing events and the present situation that causes emotional distress. The related historical events and development of the skills in specific behaviors will be needed in future situations.

3.2. Assessment (2nd to 4th phase)

In the second phase, the therapist assesses the client's skills and preparation for confrontation with stress and emotional distress (Horowitz et al., 1979; Brown, & Shapiro, 2006). In this phase, the well-formed coping skills and stabilized condition of client should be assured of. If necessary, at first, it must concentrate on learning the new skills. These skills include relaxation and coping skills.

The third phase, assessment; consists of the assessment of target memory in which the client is asked to focus on the most vivid image or thought related to the memory (if available), a negative opinion towards him/herself, and emotional and physical sensation with concomitant measurements (Kavanagh et al. 2001; Gunter,

& Bodner, 2008). The client does identify a positive opinion against the negative opinion s/he has, and determines the amount of credibility that s/he holds for these opinions. For instance, the traumatic memory of a car accident can be accompanied by the negative opinion of "It was my fault" and the opposite positive opinion could be "I have done what I could" and "It was not my fault".

In the desensitization phase, the fourth phase; the therapist asks the client to hold the target image, negative thought, and the unpleasant physical emotions while simultaneously following the therapist's hand movement direction (bilateral stimulation) with his/her eyes and following it for 20 to 30 seconds. Depending on the need a longer duration may be required (Ironson et al. 2002; van den Hout et al. 2001).

3.3. Treatment (5th to 7th phase)

In the fifth and sixth phases, installation and body scan are performed and worked on by using the EMDR method. Although the eye movement is the most common used external stimulus, the therapist also uses other stimuli like auditory sense, tapping, and various forms of tactile stimulation. The type of dual attention and the required time for each subsequent set is determined on the basis of the therapist's needs (Lee et al., 2006). The client is asked to think only on what is happening. After that the therapist demands the client to empty his/her mind and pay attention to any thoughts, emotions, images, memories, or physical emotions which s/he perceives. Based on the information presented by the client, the therapist determines the subject that should be worked on for the next step of treatment. In most cases, a client-centered association process is persuaded and it is repeated during the treatment session. If the client feels discomfort, the therapist uses some methods to help the client to continue the information processing. When the therapist is unable to reach the target memory, s/he would ask the client to pay attention to a positive thought identified by the client or a better thought existing in mind. Concentrating on the incident while simultaneously making eye movements should be done after that. (Przybyslawski et al., 1999; Suzuki et al., 2004). Following several sets, the client reports an increased confidence on the positive thought. The client will be asked about the existence of physical emotions and if any negative emotions exist, that would be processed just like above. If positive emotions exist they would be amplified.

In the seventh phase, the therapist asks the client to make a list from any events that aroused the client and made him/her to use self-calming techniques (which is taught in the second phase).

3.4. Re-evaluation (8th phase)

The next session is started with the eighth phase which consists of re-evaluation of previous works and the progress rate in comparison with the previous session. The EMDR can be used in processing of all related past events, the present distressing events, and future scenarios which need different answers. The main objective is to make the most profound and most comprehensive treatment in the least time possible. After the EMDR process, clients mostly report that the related emotional distress with the memory is reduced to a large extent and they have received an important cognitive insight on this context (Spector, & Read, 1999; Mol et al., 2005). These cognitive and emotional changes mostly lead into simultaneous personal and behavioral changes which will become better with EMDR standard methods.

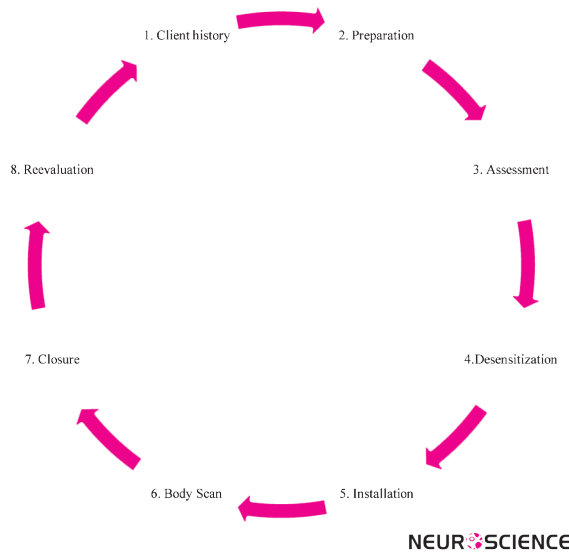


Figure 1. Different phases of EMDR

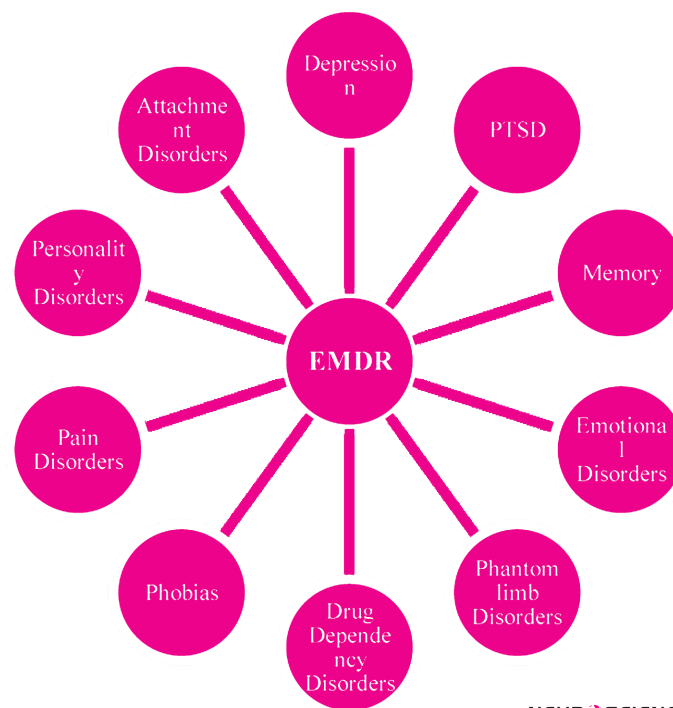
4. Discussion

The therapeutic effect of EMDR on treatment of diseases has been noted in many studies (Van Etten et al., 1998; Davidson et al., 2001). Still no clear relationship has been found between the complex sensory and emotional routes during the EMDR and therapeutic effects. One hypothesis could be (Lee et al., 2006) that dual attention stimulation can cause the provoking of orienting

response. The orienting response is a natural response consisting of attention and interest which is activated when the attention is given to the new stimulus. There are 3 different models for conceptualization of orienting response in EMDR: cognitive information processing, neurobiological model and behavioral model. These models are not specified and observe a single phenomenon from different points of view (Maxfield et al., 2002; Parker et al., 2009). Barrow Cliff and colleagues believed that orienting in EMDR is an investigatory reflex which leads into a relaxing response (basic relaxation). By the time it is determined that no threats exist, this relaxation through reciprocal inhibition leads into therapeutic result (Barrowcliff et al., 2001). Some believe that orienting response can disassemble the traumatic segment of the memory network and cut the previous concepts and in return allows the new information to be organized and formed in a new compatible shape (Feske, 1998; Ironson et al., 2002). In a study (Kuicken et al., 2001) which the orienting response was evaluated, they showed that the orienting response increases attentional flexibility. In addition, it is plausible that the orienting response induce neurobiological mechanisms which simplify the activation of episodic memories and mixing them in cortical semantic memory (Stickgold, 2002). There are various studies showing that the eye movement and other stimuli are effective on perception of the subject memory, and decreasing vividness of the image and its accompanying emotion. Two probable mechanisms are suggested for explanation of this effect of EMDR in treatment (Kvanagh et al., 2001; van den Hout et al., 2001). Some has posed a hypothesis that the effect of eye movement ruins the working memory and by a decrease in vividness, the volume of the accompanying emotion becomes lower. This group also suggests that this effect can take part in treatment like a "supplementary response for imaginary exposure" (Marks et al., 1998). Some others have proposed the hypothesis that Eye Movements (EMs) decreases the somatic perception along the recalling and this leads into decrease of excitation and vividness (Barrowcliff et al., 2001; Van Etten et al., 1998). They have proposed the theory that this effect allows the client to access some parts of his/her memory which was inaccessible before and the client could not bear its excitation. This explanation has found similarities between EMDR and reciprocal inhibition. The physiological basis of EMDR like other psychotherapies is unknown. Thus, all presented neurobiological models have theoretical aspects. The testing of the hypotheses of neurological mechanisms of EMDR needs development of advanced brain imagery techniques (Vander, 2001). Rauch and colleagues

(Rauch et al., 1996) performed PET studies on PTSD clients while they were encountered with precise and clear narrations of their traumatic memories. The clients had only shown increased activity in right hemisphere of the brain, in regions which had the most shares of emotional arousal, and the increase in the right visual cortex activity which reflected the reported flashbacks in clients. The Broca's area, a part of left hemisphere of the brain having the responsibility of interpreting the personal experience into communicable language, had shown the least activity (Rauch et al., 1996; Stickgold, 2002). The SPECT prior and after the EMDR showed an increase in activity of bilateral anterior cingulate. This region brings closer the experience of real threat to the perceived threat. Another important finding of this study was that the metabolism in pre-frontal lobe will be increased after the treatment (Vander, 2001; Stickgold, 2002). A theory had been presented to describe the effects of EMDR. During the EMDR the bilateral migratory stimulation makes the client continually take his/her attention from the middle line (Parker et al., 2009). Stickgold proposed the hypothesis that the neurobiological mechanisms similar to REM, with the change in attention, results into activation of episodic memories and combining them into cortical semantic memory (Stickgold, 2002). Some of the independent researchers have provided evidence in support of this theory. They have shown that sporadic left and right eye movements facilitate the performance of episodic

recalling memory; they had not found such effect on semantic memory (Gunter, & Bodner, 2008). Some studies have revealed the efficacy of EMDR on treatment of many diseases (Cooper et al., 1989; Chambless et al., 1998; Chemtob et al., 2000). Although these results could be due to methodological limitations in various studies, EMDR could be a treatment for these disorders. Since the EMDR is a treatment for agonizing memories, probably it is effective in treatment of anxiety disorders secondary to a traumatic experience and it is less effective in treating phobic disorders with unknown onset (for instance ophidiophobia) (Devilly, & Spence, 1999; De Jongh et al., 2002). The methodological limitations consist of failure in application of EMDR protocol and also cofounding effects after attempting to do EMDR (Maxfield et al., 2002). Some of the publishers have shown that if the EMDR protocol is done completely for phobia, it will have therapeutic effects on medical and dentistry phobias (De Jongh et al., 1998). There are case reports and case series of supplementary and palliative treatment of other medical disorders by EMDR; cases like dissociative disorders, body deformity disorders, pain disorders, personality disorders, phantom limb pain, and drug dependency disorders. Application of EMDR has been described in disorders like attachment disorder, depression, social anxiety, memory and emotional disorders, distress associated with infertility, body image disorders, and marital discord (Goodman et al., 1998; Foa et al., 2000; Shapiro, 2002b) (Figure 2).



NEURSCIENCE

Figure 2. Diseases treated by EMDR

Selective attention and its alterability into sustained attention in memory, which results in memory coding and memory storage changes, have influence on information processing and learning of new events. Hence, EMDR method can be accounted as a palliative treatment along with types of treatment and using this method due to involvement of multiple components of neural system can comprise neuro-cognitive system rehabilitation. It is recommended that further investigations follow up this path and determine the EMDR roles on attention and memory changes more than before.

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References

- Andrade, J., Kavanagh, D., & Baddeley, A. (1997). Eye-movements and visual imagery: A working memory approach to the treatment of post-traumatic stress disorder. *British Journal of Clinical Psychology, 36*, 209-223.
- Bae, H., Kim, D., & Park, Y.C. (2008). Eye movement desensitization and reprocessing for adolescent depression. *Psychiatry Investigation, 5*, 60-65.
- Brom, D., Kleber, R., Defares, P.B. (1989). Brief psychotherapy for posttraumatic stress disorders. *Journal of consulting and clinical psychology, 57*, 607-612.
- Brown, S., & Shapiro, F. (2006). EMDR in the treatment of borderline personality disorder. *Clinical Case Studies, 5*, 403-420.
- Brown, K.W., McGoldrick, T., & Buchanan, R. (1997). Body dysmorphic disorder: Seven cases treated with eye movement desensitization and reprocessing. *Behavioural & Cognitive Psychotherapy, 25*, 203-207.
- Barrowcliff, A.L., Gray, N.S., MacCulloch, S., Freeman, T.C., MacCulloch, M.J. (2001). Horizontal rhythmical eye movements consistently diminish the arousal provoked by auditory stimuli. *Br, S clin psychol, 42*, 289-302.
- Barrowcliff, A.L., Gray, N.S., Freeman, T.C.A., & MacCulloch, M.J. (2004). Eye-movements reduce the vividness, emotional valence and electrodermal arousal associated with negative autobiographical memories. *Journal of Forensic Psychiatry and Psychology, 15*, 325-345.
- Bower, G. (1981). Mood and memory. *American psychologist, 36*, 129-148.
- Carlson, J.G., Chemtob, C.M., Rusnak, K., Hedlund, N.L., & Muraoka, M.Y. (1998). EMDR for Combat-related PTSD. *J.of traumatic, stress, 11*, 324.
- Chambless, D.L., Baker, M.s., Baucom, D.H., Beutter, L.E. (1998). Update on empirically validated therapies. *The clinical psychologist, 51*, 3-16.
- Chemtob, C.M., Tolin, D.F., van der Kolk, B.A., & Pitman, R.K. (2000). Guidelines for treatment of PTSD: Eye movement desensitization and reprocessing. *Journal of Traumatic Stress, 13*, 569-570.
- Cooper, N.A., Clum, C.A. (1989). Imaginal flooding as a supplementary treatment for PTSD in Combat veterans: A controlled study. *Behavior therapy, 28*, 381-391.
- Davidson, P.R., parker, K.ch. (2001). Eye movement desensitization and processing: A meta-analysis. *J of consulting and clin psychology, 69*, 305-316.
- De Jongh, A., ten Broeke, E., Reussen, M.R. (1998). Treatment of specific phobias, with eye movement desensitization and reprocessing: protocol, empirical status and conceptual issues. *J of Anxiety Dis, 13*, 69-85.
- De Jongh, A., van der Ord, H.S., Ten broeke, E. (2002). Efficacy of EMDR in the treatment of specific phobia: 4 single-case studies on dental phobia. *J, of clin psychology, 58*, 1489-1503.
- Devilly, G.J., & Spence, S.H. (1999). The relative efficacy and treatment distress of EMDR and a cognitive behavioral treatment protocol in the amelioration of post traumatic stress disorder. *Journal of Anxiety Disorders, 13*, 131-157.
- Engelhard, I.M., van den Hout, M.A., Janssen, W.C., van der Beek, J. (2010). Eye movements reduce vividness and emotionality of "flashforwards." *Behavior Research and Therapy, 48(5)*, 442-7.
- Feske, U. (1998). Eye movement desensitization and reprocessing treatment for posttraumatic stress disorder. *Clinical Psychology: Science and Practice, 5*, 171-181.
- Foa, E.B., Steketee, G., & Rothbaum, B. (1989). Behavioral/cognitive conceptualizations of post-traumatic stress disorder. *Behavior Therapy, 20*, 155-176.
- Foa, E.B., & Rothbaum, B.O. (1998). Treating the trauma of rape: A cognitive-behavioral therapy for PTSD. New York: Guilford Press.
- Foa, E.B., Friedman, M., & Keane, T. (2000). Effective treatments for posttraumatic stress disorder: Practice guidelines from the International Society for Traumatic Stress Studies. New York: Guilford Press.
- Goodman, L.A., Corcoran, C., Turner, K., Yuan, N., & Green, B.L. (1998). Assessing traumatic event exposure: General issues and preliminary findings for The Stressful Life Events Screening Questionnaire. *Journal of Traumatic Stress, 11*, 521-542.
- Gunter, R.W., & Bodner, G.E. (2008). How eye movements affect unpleasant memories: Support for a working-memory account. *Behaviour Research and Therapy, 46*, 913-931.
- Horowitz, M.J., Wilner, N., & Alvarez, W. (1979). Impact of event scale: A measure of subjective distress. *Psychosomatic Medicine, 41*, 207-218.

- Ironson, G.I., Freund, B., Strauss, J.L., & Williams, J. (2002). A comparison of two treatments for traumatic stress: A community based study of EMDR and prolonged exposure. *Journal of Clinical Psychology, 58*, 113-128.
- Kavanagh, D.J., Freese, S., Andrade, J., & May, J. (2001). Effects of visuospatial tasks of desensitization to emotion memories. *British Journal of Clinical Psychology, 40*, 267-280.
- Keane, T.M., Fairbank, S.A., Caddail, J.M., Zimmeneing, R.T. (1989). Implosive (Flooding) therapy reduces symptoms of PTSD in Vietnam Combat veterans Behavior therapy, 20, 245-260.
- Kuiken, D., Bears, M., Miall, D., & Smith, L. (2001). EMDR Facilitates attentional orienting imagination, cognition and personality, 1; 3-30.
- Kuiken, D., Bears, M., Miall, D., & Smith, L. (2001-2002). Eye movement desensitization reprocessing facilitates attentional orienting. *Imagination, Cognition and Personality, 21* (1), 3-20.
- Lee, C.W., Taylor, G., & Drummond, P.D. (2006). The active ingredient in EMDR: Is it traditional exposure or dual focus of attention? *Clinical Psychology and Psychotherapy, 13*, 97-107.
- Maxfield, L., Heyer, L.A. (2002). The relationship between efficacy and methodology in studies investigating EMDR treatment of PTSD. *J. of clin psychology, 58*, 23-41.
- Mol, S.S.L., Arntz, A., Metsemakers, J.F.M., Dinant, G., Vilters-Van Montfort, P.A.P., & Knottnerus, A. (2005). Symptoms of post-traumatic stress disorder after non-traumatic events: Evidence from an open population study. *British Journal of Psychiatry, 186*, 494-499.
- Parker, A., Buckley, S., & Dagnall, N. (2009). Reduced misinformation effects following saccadic bilateral eye movements. *Brain and Cognition, 69*, 89-97.
- Przybylski, J., Rouillet, P., & Sara, S.J. (1999). Attenuation of emotional and nonemotional memories after their reactivation: Role of β adrenergic receptors. *Journal of Neuroscience, 19*, 6623-6628.
- Rauch, S.L., van der Kolk, B.A., Fisler, R.E., Alpert, N.M., Orr, S.P., Savage, C.R., Fischman, A.J., Jenike, M.A., Pitman, R.K. (1996). A symptom provocation study of PTSD using PET and script-driven imaging. *Arch Gen psychiatry, 53*, (5) 3807.
- Shapiro, F. (1989). Eye movement desensitization: A new treatment for post-traumatic stress disorder. *Journal of Behavioral therapy and experimental psychiatry, 20*, 211-217.
- Shapiro, F. (1995). *Eye movement desensitization and reprocessing: Basic principles, protocols and procedures* (1st Edition). New York: Guilford press.
38. Shapiro, F. (1998). Efficacy of eye movement, desensitization procedure in the treatment of traumatic memories. *J of thraumatic stress, 2*, 199-223.
- Shapiro, F. (2001). *Eye movement desensitization and reprocessing: Basic principles, protocols, and procedures* (2nd ed.).
- Shapiro, F. (2002a). *EMDR: Basic Principles, protocols and procedures* (2 nd Ed). New York: Guilford press.
- Shapiro, F. (2002b). *EMDR as an integrative psychotherapy approach: experts of diverse orientation explore the paradigm prism*. Washington DC. APA press.
- Spector, J., & Read, J. (1999). The current status of eye movement desensitization and reprocessing (EMDR). *Clinical Psychology and Psychotherapy, 6*, 165-174.
- Stickgold, R. (2002). EMDR: a putative neurobiological mechanism of action. *clin psycho, 58* (1), 61-75.
- Suzuki, A., Josselyn, S.A., Frankland, P.W., Masushige, S., Silva, A.J., & Kida, S. (2004). Memory reconsolidation and extinction have distinct temporal and biochemical signatures. *Journal of Neuroscience, 24*, 4787- 4795.
- Vander Kolk, B.A. (2001). The psychobiology and psychopharmacology of PTSD. *Hum psychopharmacol, 16* (51), 49-64.
- Van den Hout, M., Muris, P., Salemink, E., & Kindt, M. (2001). Autobiographical memories become less vivid and emotional after eye movements. *British Journal of Clinical Psychology, 40*, 121-130.
- Van Etten, M., Tayler, S. (1998). Comparative efficacy of treatments for PTSD: A meta-analysis. *Clinical psychology and psychotherapy, s*, 126-144.
- Verder folk, B.A. (2002). *Beyen the talking cure: somatic experience and subcortical imprints in the treatment, of truma*, in: Shapiro f(Ed), *EMDR as an integrative treatment approach: experts of diverse orientation explore the paradigm prism*. Washington DC: American psychological association books.
- Williams, J.M.G., Watts, F.N., MacLeod, C., & Mathews, A. (1997). *Cognitive psychology and emotional disorders*, 2nd ed. Chichester: Willey.