

# Effectiveness of Eye Movement Desensitization and Reprocessing Technique in Acute Stress Disorder Occuring After Traffic Accidents

■ Ebru SİNİCİ<sup>1</sup>, Gülsen ERDEN<sup>2</sup>, Taner ÖZNUR<sup>3</sup>, Erden KILIÇ<sup>4</sup>

- 1 Cln Psychologist. Gulhane Military Medical Faculty, Department of Psychiatry , Ankara  
 2 Prof.Dr.Ankara University, Faculty Of Languages, History And Geography, Department of Psychology, Ankara  
 3 Assist. Prof. Dr. Gulhane Military Medical Faculty, Department of Psychiatry, Ankara  
 4 M.D. Gulhane Military Medical Faculty, Department of Orthopaedics and Traumatology, Ankara

**Yazışma adresi:**  
 Ebru Sinici, GATA  
 Department of  
 Psychiatry, Etik-  
 06018, Ankara,  
 TURKEY  
 esinici@gmail.com

## ABSTRACT

**Purpose:** The purpose of the study was to assess the effectiveness of Eye Movements, Desensitization and Reprocessing (EMDR) technique as an alternative method in the treatment of acute stress disorders following traffic accidents.

**Method:** The study group consisted of thirty adults that demonstrated signs and symptoms of acute stress disorder during their hospitalization in the Orthopedics and Traumatology Department of Gülhane Military Medical Academy after a traffic accident between January 2007 and December 2008. All patients were required to be at least primary school graduates and consented to participate to the study. Control group consisted of 20 adults with comparable demographic characteristics. EMDR was performed by a device that presented sound and tactile vibrations. All patients were initially evaluated by Symptom Screening List (SCL 90-R), State-Trait Anxiety Inventory (STAI-1) and Beck Depression scale. Tests were re-performed to study group just after EMDR; 1 week and 4 weeks after EMDR; SCL 90-R was re-performed only 4 weeks after EMDR. Control group received the tests at the same time points after the interview.

**Findings:** Study results showed significant differences between pre and post-EMDR scores of Symptom Screening List (SCL 90-R), State Trait Anxiety Scale (STAI-1) and Beck Depression Scale ( $p < 0.05$ ), but no such difference was observed between the baseline and post-interview scores of the control group ( $p > 0.05$ ).

**Discussion:** EMDR treatment was effective on the symptoms of acute stress disorder occurring after the traffic accidents. Severity of physical injury of patients was positively associated with the state anxiety levels and inversely associated with the clinical response of EMDR. For all these and other findings reasons are discussed.

**Conclusion:** Our results suggest that EMDR technique may be effective in the treatment of acute stress disorder following a traffic accident.

**Keywords:** acute stress disorder, eye movements desensitization and reprocessing technique (EMDR), traffic accident

## Trafik Kazaları Sonrasında Gelişen Akut Stres Bozukluğunun tedavisinde Göz Hareketleri ile Duyarsızlaştırma ve Yeniden İşleme (EMDR) Tekniğinin Uygulanabilirliği

## ABSTRACT

**Amaç:** Bu çalışmanın amacı, trafik kazalarından sonra gelişebilen akut stres bozukluğunun tedavisinde alternatif bir yöntem olan göz hareketleri ile duyarsızlaştırma ve yeniden işleme (EMDR) tekniğinin uygulanabilirliğini değerlendirmektir.

**Yöntem:** Çalışma grubu Ocak 2007- Aralık 2008 tarihleri arasında GATA Ortopedi ve Travmatoloji AD'de trafik kazası nedeniyle tedavi gören ve akut stres bozukluğu belirtileri görülen olan 30 yetişkinden oluştu. Tüm hastalar en az ilköğretim mezunu olup, çalışmaya gönüllü olarak katıldılar.

Çalışmaya yine aynı koşullara sahip 20 yetişkin de kontrol grubu olarak alındı. Tüm hastalar Belirti Tarama Envanteri (SCL 90-R), Durumluk Kaygı ölçeği (STAI-1) ve Beck Depresyon ölçeği ile değerlendirildi. EMDR uygulaması için dokunma ve ses titreşimlerini sağlayan cihaz kullanıldı. Ölçekler çalışma grubuna EMDR uygulama sonrası hemen, bir hafta sonra ve 4 hafta sonra tekrarlanırken; SCL 90-R ise sadece 4 hafta sonra tekrarlandı. Kontrol grubuna ise testler ön görüşmeden sonra aynı zamanlarda uygulandı.

**Bulgular:** Araştırmanın bulguları EMDR uygulaması öncesi Belirti Tarama Envanteri (SCL 90-R), Durumluk Kaygı ölçeği (STAI-1) ve Beck Depresyon ölçeği puanları ile uygulama sonrası ölçüm puanları arasında anlamlı fark gözlemlendi ( $p < 0.05$ ). Kontrol grubundaki katılımcıların görüşme öncesi ve sonrası ölçüm puanlarında ise anlamlı fark görülmemiştir ( $p < 0.05$ ).

**Tartışma:** EMDR tedavisi trafik kazaları sonrasında meydana gelen akut stres bozukluğunun semptomları üzerinde etkili olmuştur. Fiziksel yaralanmanın şiddetinin durumluk kaygı düzeyi ile doğru orantılı iken, EMDR'ye klinik yanıt ile ters orantılı olduğu izlenmiştir. Bütün bunlar ve diğer bulguların sebepleri nelerdir makalede tartışılmıştır.

**Sonuç:** Çalışma EMDR tekniğinin trafik kazası sonrasında gelişen akut stres bozukluğunun tedavisinde etkili olabileceğini göstermektedir.

**Anahtar Kelimeler:** akut stres bozukluğu, göz hareketleri ile duyarsızlaştırma ve yeniden işleme (EMDR), trafik kazası

## INTRODUCTION

People inevitably come across a variety of traumatic incidents including traffic accidents, natural disasters, assault, rapes etc. during their lives. Although anybody may be affected; males, adolescents, minorities, individuals with neurotic or extroverted personality, self or family history of a psychiatric disease, previous exposure to trauma and adaptive problems have been said to carry a higher risk (Aker and Acicbe 2004). This suggests some predisposing factors may play role for an event to create a traumatic effect or to be perceived as it did. Age, gender, social and cultural status, unpleasant experiences during childhood, adverse events in life, insufficient social support or functionality, history of a psychiatric disease or genetic, biological or psychological disposition may promote the emergence of such traumatic effect (Bryant and Harvey 1995).

Worldwide, the number of people killed in road traffic accidents each year is estimated at almost 1.2 million, while the number injured could be as high as 50 million (WHO Report 1999). Traffic accidents may lead to psychological injuries in addition to physical injuries; however, there are limited studies that describe the frequency of their psychological consequences. Incidence of acute stress disorder (ASD) following a traffic accident ranges from 18% to 42% (Bryant and Harvey 1995, Mayou et al. 1993). ASD is more common among the victims that stay conscious just after the accident (Mayou et al. 1993). Post-traumatic stress disorder (PTSD) is the most remarkable consequence; 57 to 83% of ASD may progress to post-traumatic stress disorder (PTSD) (Brewin et al. 1999, Harvey and Bryant 2000). In their series, Mayou et al. have diagnosed PTSD in 10% of the victims within one year following traffic accident (Mayou et al. 1993, Mayou et al. 1997). Travel anxiety may be observed in both drivers and passengers even 5-6 years after a traffic accident (Mayou et al. 1997). Individuals that develop stress reactions after trauma carry a higher risk for chron-

ic psychiatric morbidity. These individuals need imminent care because they may develop violent behaviors that may harm self or close others (Özkürkçügil 2000).

“Eye Movement Desensitization and Reprocessing” (EMDR) technique is a novel psychological method used for the treatment of post-traumatic disorders and some other problems including phobia, anxiety, panic disorder and chronic pain. The aim of this study was to assess the effectiveness of EMDR in the treatment of acute stress disorder that usually presents with excessive fear, helplessness and emotional unresponsiveness along with similar symptoms observed within the first four weeks after the traffic accident and may seriously reduce the quality of life of the sufferer.

## METHOD

### Participants

The participants were selected from a larger clinical admission group (of 50 randomized participants) to take part in the current research. Study group consisted of 30 adults that aged between 20 and 40 and demonstrated signs and symptoms of acute stress disorder during their hospitalization in the Orthopedics and Traumatology Department of Gülhane Military Medical Academy after a traffic accident between January 2007 and December 2008. — All patients were required to be at least primary school graduates and consented to participate to the study. Control group consisted of 20 adult patients with similar demographic characteristics Inclusion criteria were having the traffic accident within 30 days, no previous psychiatric treatment, no head trauma and a general health status that would not hinder patients’ participation to the study. Patients that consented to participate in the

**Tablo 1** Demographic parameters of the sample group

	Study group	Control group
Age	Range=21-38 Mean=27	Range=19-46 Mean=24.8
Gender	Female=5 (%16.7) Male=25 (%83.3)	Male=20 (%100)
Education	Primary school= 2 (%6.6) High school= 24 (%80) University= 18 (%13.4)	Primary school= 8 (%40) High school= 9 (%45) University= 3 (%15)
Marital status	Married=18 (%40) Single= 12 (%60)	Married=7 (%35) Single= 13 (%65)
Trauma	Single trauma= 19 (%63.3) Multi trauma= 11 (%36.7)	Single trauma= 17 (%85) Multi trauma= 3 (%15)

study after the first interview were included among the search or control group by a random placement. Written and signed informed consent was obtained from all patients. Control group was informed about the study during the supportive conversation.

### Procedure

Study was approved by the ethical committee of the institute. All procedure was implemented in the psychological interview room specifically arranged for EMDR in the Orthopedics and Traumatology Department of Gülhane Military Medical Academy.

Each of the thirty patients in the experimental group received one session of EMDR. Each session lasted for 90 to 120 minutes. Six months after EMDR the status of each participant was inquired by telephone call.

Patients were informed about the study during the initial interview and those accepted to participate were asked to sign the consent form.

All patients were initially evaluated by Symptom Screening List 90-Revised (SCL 90-R), State-Trait Anxiety Inventory (STAI I-II) and Beck Depression scale. Tests were re-performed to study group just after EMDR; 1 week and 4 weeks after EMDR; SCL 90-R was re-performed only 4 weeks after

**Tablo 2** Mean and standard deviations of the scores of all scales before and after EMDR.

	Before EMDR		After EMDR 1		Before EMDR 2		After EMDR 3		F
	M	SD	M	SD	M	SD	M	SD	
Beck depression	1.87	1.106	0.60	0.814	0.37	0.85	0.07	0.254	44.435*
STAI I (State)	2.47	0.571	2.40	0.56	1.93	0.52	1.20	0.40	48.509*
SCL-90 R Subtests /									
Somatization	0.833	0.379					0.033	0.182	116.00*
OCD	0.90	0.305					0.000	0.000	261.00*
Interpersonal Sensitivity	0.833	0.379					0.066	0.253	95.286*
Depression	0.90	0.305					0.066	0.253	145.00*
Anxiety	0.933	0.253					0.000	0.000	406.00*
Anger Hostility	0.833	0.379					0.00	0.000	145.00*
Phobia	0.266	0.449					0.000	0.000	10.545*
Paranoid Symptoms	0.400	0.498					0.066	0.253	14.500*
Psychotism	0.366	0.49					0.000	0.000	16.789*
Add. Scale	0.933	0.253					0.066	0.253	188.50*
General assessment	0.866	0.345					0.000	0.000	188.50*

\* : p<0.05

Note 1: Measurement performed just after EMDR

2: Measurement performed 1 week after EMDR

3: Measurement performed 1 month after EMDR

EMDR. Control group received the tests at the same time points after the first interview.

Author that conducted the research was certified for EMDR after EMDR training in the

**Tablo 3** Mean and standard deviations of the scores of all scales of the control group before and after interview.

	Before interview		After interview 1		After interview 2		F
	M	SS	M	SS	M	SS	
Beck depression	1.65	0.988	0.60	0.821	1.45	0.999	10.024
STAI I (State)	2.15	0.813	2.20	0.768	2.35	0.745	0.553
SCL-90 R Subtests/Somatization	0.60	0.50			0.55	0.51	0.192
OCD	0.45	0.51			0.55	0.51	0.655
Interpersonal	0.35	0.489			0.40	0.50	0.322
Sensitivity Depression	0.35	0.489			0.55	0.51	4.750
Anxiety	0.20	0.41			0.35	0.49	1.879
Anger hostility	0.25	0.44			0.50	0.51	4.130
Phobia	0.15	0.366			0.20	0.41	0.322
Paranoid	0.30	0.47			0.25	0.44	0.192
Symptoms Psychotism	0.35	0.489			0.30	0.47	0.192
Add. Scale	0.55	0.51			0.40	0.50	1.879
General assessment	0.30	0.47			0.40	0.50	1.000

Note 1: Measurement just after EMDR

2: Measurement 1 week after EMDR

Institute of Behavioral Sciences that included two phases of education under supervision.

### Material

State-Trait Anxiety Inventory: State-Trait Anxiety Inventory (STAI-I) was developed by Spielberger CD, Gorsuch RL and Lushene RE (1965). It was adapted to Turkish by Öner N and Le Compte A (1977). Low scores indicate that the individual perceives the stressing condition as non-threatening, high scores indicate that individual perceives the stressing incident as threatening. It measures the state, i.e present level of anxiety of the individual (Öner 1997).

Beck Depression Scale: Developed by A.T. Beck, this scale measures the somatic, emotional, cognitive and motivational symptoms observed in depression (Savaşır and Şahin 1997). It is intended to provide an objective measure of depressive symptoms, but not to diagnose depression.

Symptom Distress Checklist (SCL-90-R): This test is used to assess the symptoms of psychological distress. Validity and reliability tests of Turkish version have been performed. This is a symptom screening test that measures the level of pressure sustained and individual's reaction to stress. It has 90 items and 10 subtests. These are somatization, obsessive-compulsive, interpersonal sensitivity, depression, anxiety, anger-hostility, phobic anxiety, paranoid ideation, psychoticism, and additional items (Öner 1997).

### Data Analysis

Data for repeated measurements was analyzed by ANOVA test in SPSS 15.0 software. Significance was assessed by Tukey test for multiple comparisons. A p value less than 0.05 were set as significance threshold (within 95% confidence interval).

### FINDINGS

Demographic characteristics of the study and the control group are presented in Table 1. Groups were comparable in terms of demographic data. Mean scores and standard deviation of test results of the study group and the control group is presented in Table 2 and Table 3 respectively. Both groups were also comparable in terms of baseline scores of the three tests.

Beck depression scale scores before EMDR and just after, 1 week and 1 month after EMDR showed significant difference ( $F_{3,87}=44.435$   $p<.05$ ). Comparison of groups by Tukey test to determine the source of significance

showed significant differences between the first (pre-EMDR) (mean: 1.87 SD: 1.11) and the second assessment (mean: 0.60; SD: 0.81) ( $q=127$ ); between the first and the third assessment (mean: 0.37; SD: 0.85) ( $q=150$ ), and between the first and the last assessment (mean: 0.07; SD: 0.25) ( $q=180$ ). These results indicate a continued decrease in the depression level of EMDR patients. However, Beck depression scale scores of the control group measured just after, and 1 week and 1 month after the interview showed no significant difference ( $F_{2,38}=1.760$   $p>.05$ ).

State anxiety scores before EMDR and just after, 1 week and 1 month after EMDR showed significant differences ( $F_{3,87}=48.509$   $p<.05$ ). Comparison of groups by Tukey test to determine the source of significance showed no significant difference between the first (pre-EMDR) (mean: 2.47 SD: 0.57) and the second assessment (mean: 2.40; SD:0.56) ( $q=0.87$ ), whereas significant difference was observed between the first and third assessment (mean:1.93; SD:0.52) ( $q=6.75$ ), and between the first and the last assessment (mean:1.20; SD:0.41) ( $q=15.87$ ). These results indicate that EMDR demonstrated a positive effect on the state anxiety levels of the participants after the first week.

However, Beck depression scale scores of the control group before the interview showed no significant difference with those measured just after, 1 week and 1 month after the interview ( $F_{2,38}=1.145$   $p>.05$ ).

Global severity index of SCL 90-R before and 1 month after EMDR showed significant difference ( $F_{1,29}=188.50$   $p<.05$ ). Similarly, all subscales of SCL 90-R (somatization, obsessive-compulsive, interpersonal sensitivity, depression, anxiety, hostility, phobic anxiety, paranoid ideation, psychoticism) before EMDR showed significant difference compared to scores 1 month after EMDR ( $F_{1,29}=116.00$   $p<.05$ ). In the control group, neither global severity index nor the subscales showed a significant difference between the scores before EMDR and 1 month after EMDR ( $F_{1,19}=.192$   $p>.05$ ).

### DISCUSSION

Considering the huge number of traffic accidents and injured people worldwide, one may anticipate high incidence of psychological consequences. However, psychological symptoms are frequently missed because both patients and doctors focus primarily on physical injuries (Burstein 1989). Up to 42% of traffic accident

victims suffer from ASD which has been implicated as a risk factor for PTSD (Brewin et al. 1999, Bryant et al. 2000). Thus, early diagnosis and treatment of those at risk will prevent the development of PTSD.

A number of methods are being used in the treatment of post-traumatic disorders. EMDR is a novel psychological method used for the treatment of psychological problems provoked by accident, war stress, abuse, natural disasters and unpleasant events during childhood and for some other disorders such as phobia, performance anxiety, panic disorder, body dysmorphic disorder, traumatic symptoms in children, moaning, and chronic pain. EMDR combines several well-known methods such as psychodynamic, cognitive, behavioral and counselor-oriented approaches (Shapiro 2001). EMDR may be considered as a combination treatment formed by conventional psychological methods (Shapiro, Maxfield 2002). Several controlled studies have proven the success of EMDR in the treatment of psychological effects of trauma and other disorders (Rothbaum 1997, Van Etten and Taylor 1998, Protinsky et al. 2001, Kışlak 2004). In their review, Rogers and Silver (2002) emphasized that EMDR used information processing different from systematic desensitization, internal explosion or cognitive therapy. Review of the theories that to explain the mechanism of acute stress disorder has suggested that EMDR may be effective in patients with acute stress disorder.

In our study, Beck depression scores were found to be higher as reported in the literature (Malt et al. 1993, Blanchard et al. 1996). Perception of their lives threatened during accident (Green et al. 1993) and fear of death (Blanchard et al. 1996) have been suggested as predisposing factors for PTSD. Higher scores for Beck depression scale among injured victims may be caused by facing a life-threatening situation or perception of a close threat to body integrity. Scores of Beck depression scale showed a progressive decrease just after EMDR until the last follow-up. The reason for regression of depressive symptoms after single EMDR session may be accelerated information processing during EMDR. Wilson et al. (1995) have also observed that symptoms of depression and anxiety were greatly relieved after one or two sessions of EMDR. These findings suggest that EMDR opens the lock and relieves the obstruction in information processing that is formed by traumatic incidents, and restarts information pro-

cessing by right and left stimuli to achieve a resolution that would provide adaptation; all of which combined be effective in reducing the symptoms of acute stress disorder including depressive symptoms. Studies on rapid effect of EMDR have shown that eye movements during EMDR were similar to eye movements during REM period of sleep and equal distances taken during right and left movements of eyes led to stimulation of both hemispheres and particularly corpus callosum (Van der Kolk 1994).

STAI-I scores did not show a significant difference between baseline and the first measurement just after EMDR. During the sessions, participants expressed their concern regarding the rapid change, whether it would be permanent or temporary. This concern may be the reason for no significant change between baseline and first post-EMDR score of trait anxiety. Similar finding has been reported by Rothbaum et al. (2005). However, soon after realizing the outcome of these concerns, patients expressed relaxation and reduced tension during the 3<sup>rd</sup> and 4<sup>th</sup> measurements performed 1 week and 1 month after EMDR respectively. Healing of physical injuries by time might also relieve the concerns about body integrity.

In our study, all subscales of SCL 90-R showed significant differences after EMDR. Scores of somatization subscale were found to be high, which is consistent with the literature (Klaric et al. 2007). Fractures or soft tissue injuries caused by traffic accidents attract the victims' thoughts to body integrity. However, second measurement performed one month later showed a significant difference. This difference may be related to EMDR, but it should be noted that physical injuries also heal in the meantime. However, lack of such significant change in the control group indicates that this change cannot solely be attributed to healing of physical injuries. Therefore, it can be inferred that EMDR method has been effective on symptoms of somatization.

Scores of obsessive-compulsive subscale were found to be higher in both groups, however obsession and compulsion (OC) has been shown to be widely present in the general population as indicated by a study on university students in which more than 80% of the participants expressed that they had intractable thoughts or impulsive behaviors (Salkovskis and Harrison 1984). Studies assessing the effects of traumatic incidents on OC symptoms have shown that OC

symptoms are associated with traumatic incidents during childhood both in patients with OC disorder and individuals with no clinical symptoms (Murphy et al. 1988, Lochner et al. 2002). Considering the association between trauma and OCD, some authors suggested that thoughts related trauma might transform into obsession by time (De Silva and Marks 1999). Cognitive approach assumes that clinically significant obsession usually derives from slight impulsive thoughts (Wegner et al. 1987). Thus, it seems possible that some disappointing thoughts related to traumatic incident might convert to clinical obsessions. Another approach suggests that a traumatic incident may trigger the conversion of non-bothering thoughts to obsession. In our study, OC symptoms were significantly reduced after EMDR. In their study, Von Knorring et al. (2005) have also reported the benefits of EMDR in general anxiety disorders (OCD, PTSD etc).

Scores of interpersonal sensitivity subscale were also high before EMDR. Having a physical injury, one compares self with others and feels desperate and dependent during interpersonal relations, which leads to development of negative thoughts such as experiencing inconvenience and troubles during these relations. Introversions of the injured individual may cause a negative perception about social support (Özaltın et al. 2004). EMDR was effective in reducing negative self-thoughts and feelings of the individual which was reflected by second measurement performed 1 month after EMDR.

Scores of the depression subtest of SCL 90-R scale was consistent with the scores of Beck Depression scale. Blanchard et al. (1994) have reported that depressive symptoms are one of the psychiatric clinical pictures that accompany stress disorders following a traffic accident. The results of second measurement performed just after EMDR showed significant difference to baseline. Carlson et al. (1998) have assessed the efficacy of EMDR method on war veterans and reported a reduction in the depression scores similar to results of our study.

Scores of the anxiety subscale of SCL 90-R were high, and consistent with the state anxiety scores. Studies investigated the psychological disorders after traffic accidents have shown that 15-22% of the victims experience travel anxiety or general anxiety disorder (Blanchard et al. 1995, Mayou et al. 1997, Koren et al. 1999). Lipke et al. (2003) pointed out several studies which revealed that eye movements

during EMDR reduced the life of the accident-related memories and feelings and increased access to the memory (Kavanagh, Freese et al. 2001).

Baseline scores for anger-hostility subscale were significantly higher compared to normal. However, some studies that investigated stress disorders (Taylor 2003, Foa et al. 1995) showed lower pretreatment anger scores related to trauma. In another study (Stapleton et al. 2006) situational anger scores were higher compared to trauma-related anger scores. According to Henning and Frueh (1997) thoughts of anger associated with trauma initiates re-experiencing of the traumatic event. Thus, the intensity of anger may correlate with the severity of depressive symptoms. In our study, EMDR significantly reduced the anger symptoms of the participants.

Patients that developed ASD after traffic accident showed higher phobia scores. Scores were significantly reduced 1 month after EMDR. Phobic avoidance may be observed in up to 50% of the patients with posttraumatic stress disorder (Blanchard et al. 1995, Koren et al. 1999). Patients that suffer from a trauma-related phobia have an obvious starting point. A dramatic and stressful experience creates the phobia. EMDR is accepted as the method of choice for working on and desensitization of memories that cause phobia. EMDR favors the translation of the problems during resolution of traumatic memories (Roos and de Jongh 2008).

Paranoid thought scores were also higher after traffic accident. Parson (1997) has shown that patients might have paranoid thoughts after trauma; however patients with chronic PTSD may develop personality disorders. In this study, reduction of paranoid thoughts showed that EMDR had some effect on these thoughts.

Symptoms of psychotism were found to be higher at the first measurement. Klaric et al. (2007) have shown that traumatized people frequently express psychotic symptoms. In another study, 18% of the patients with PTSD were found to have psychotic symptoms (Hamner 1997). In our study, psychotic symptoms seemed to resolve at the second measurement performed at 2<sup>nd</sup> month, which might be attributed to EMDR.

Scores of additional subscales (sleep disorders) showed significant difference before and after EMDR. According to Shapiro (1989) eye movements during EMDR may stimulate same

processes that take place during REM sleep. Some studies demonstrated that traumatized individuals have non-functional REM periods of sleep (Ross et al. 1989, 1994). This is why war veterans awaken in the middle of the nightmares rather than the end. According to Shapiro (1995) these results support the idea that cognitive processing or memory processing are associated with eye movements.

Participants that could be inquired 6 months after EMDR reported that they felt easy, happy and assured and could fall asleep easily. This finding is very important for EMDR, because participants were surprised about the rapid changes in their mood and they were worried about whether these effects were temporary or permanent. Preservation of these effects, particularly when expressed by participants becomes very important in this regard. Results retrieved from the participants by phone call to learn their most recent situations at sixth month were also consistent with the studies that included scales related to stress disorders, depression or anxiety. One of these studies by Scheck, Schaeffer and Gilette (1998) have shown that positive effect on PTSD, anxiety, and depression scores were maintained at three months. De Jongh et al. (2002) have reported progressive reduction of anxiety in their patients within six weeks.

Zabukovec et al. (2000) considers EMDR as a method that indicates the need for an integral approach of extended psychotherapy. In their study, observations and feedbacks just after and in the subsequent months after EMDR showed that participants had better feelings. Effect is maintained long enough and symptoms are gradually reduced which suggest that PTSD that may develop in the near future can be potentially prevented.

The vast majority of the psychological problems (sleep disturbances, flashbacks etc.) observed after traumatic incidents are caused by inability to process the negative feelings related to the event rather than the event itself (Shapiro 1999). The intent of EMDR is to assist the individual in processing the information related to the traumatic incident. Patient is asked to concentrate on the distressing scene, thought, emotion or bodily sense while bilateral stimulation is presented. Throughout the procedure, information processing failed to function properly in the past is reactivated and processing of the emotional distress imposed by the event or situation is resumed from the

point of interruption. The goal is not only reducing the stress of the consulting individual, but also replacing the negative thoughts related to past event or situation with positive attitudes and providing the best possible functionality for the individual by means of behavioral change (Shapiro 1999).

Considering the neurobiological researches that defined the main role of REM period as information processing and storage (Sutton et al. 1992, Winson 1993) Shapiro suggested that eye movements during EMDR activates information processing similar to REM. When patient is asked to retrieve a picture about the traffic accident during the EMDR session, physiologically stored information is stimulated. Concurrent bilateral stimulation activates the information processing system. With each new set, target memory is modified until it becomes healthy and functional, and at that point information is restructured in the neuronal network. Bilateral stimulation assists the transfer of information from right hemisphere to left hemisphere and stimulates the injured right hemisphere to become active and functional. Several reports supported the effect of bilateral stimulation on transfer of traumatic memories from right to left hemisphere by facilitating forward or reverse transfer of information between the hemispheres (Van Der Kolk 1994, 1997).

Recent studies have suggested that eye movements during the EMDR operate as a visual-spatial task which helps to desensitize the individual to traumatic memories (Andrade et al. 1997, Kavanagh et al. 2001, Van den Hout et al. 2001). Lilley et al. (2007) has used right and left movements of the eye to smooth the worst moment of the trauma (Holmes et al. 2005) in a traumatized patient. Visual-spatial tasks other than eye movements (tapping the knees, stimulation by sound etc.) have been shown to exert a similar effect. Some authors have claimed these tasks could be used as adjunctive methods to other treatment methods that are based on image formation (Holmes and Bourne 2008). In the present study, desensitization to traumatic memories was achieved by sound stimulation.

Another possible mechanism for effectiveness of EMDR is that it includes exposure technique that faces the participant to the accident related memories. In a study on rape victims, long-term exposure technique has been compared with EMDR (Rothbaum et al. 2005). Author concluded that both EMDR and long-term expo-

sure was effective techniques that helped victims to face the memories related to attack, where exposures are repeated until the attack is recalled with no or little anxiety. Both methods assist emotional processing of trauma and aim to achieve cognitive modifications during the course of treatment. Ironson et al. (2002) has shown that EMDR and long-term exposure methods have worked well in controlling symptoms of PTSD and depression, and maintaining the improvements within three months follow-up period. Our study also showed similar improvement.

Generally, studies provide substantial data about the efficacy of EMDR in stress disorders. A controlled study by Vaughan et al. (1994) that compared exposure, muscle relaxing and EMDR methods, EMDR was found to provide significant reduction of the PTSD symptoms similar to our study. In the study of Protinsky et al. (2001), that compared EMDR, relaxation and exposure, improvement of effects of trauma was shortest by EMDR (Lipke 1992, Vaughan et al. 1994).

## CONCLUSION

EMDR has accepted as an evidence-based treatment method by Health Department of United Kingdom (2001), American Psychiatry Association (2004), Australian Posttraumatic Mental Health Center (2007) and Netherlands National Guidance Committee for Principles of Mental Health Care (2003). However there are different theories about the mechanism of action of EMDR (Rogers and Silver 2002, Smyth and Poole 2002).

Despite these researches and past experience, EMDR is a developing method. Clinical controlled experimental studies on trauma and other psychological disorders are required to enhance their use in different cultures and developing countries. However, many clinical studies have proven that EMDR provides rapid improvement and better results in PTSD than other treatment methods (Chemtob et al. 2002, Carlson et al. 1998, Maxfield and Hyer 2002, Van Etten and Taylor 1998, Davidson and Parker 2001).

This study has shown the efficacy of EMDR in reducing the symptoms of ASD following traffic accident. Therefore EMDR method is an effective alternative in the treatment of acute stress disorder. Not only statistical analysis, but also improvements reported by the patients, their way of expressing their feelings and positive changes that lasts for long term may be

considered as additional evidences for the efficacy of EMDR.

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