

Evaluation of EMDR Therapy Efficacy in Treatment of Phantom Limb Pain

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ABSTRACT

Evaluation of EMDR therapy efficacy in treatment of phantom limb pain

Objective: The aim of this study was to determine the effectiveness of Eye Movements of Desensitization and Reprocessing (EMDR) therapy in the treatment of the phantom limb pain.

Method: Participants of this study consist of amputation applied 14 inpatients in the Orthopaedics and Traumatology Department of Gülhane Military Hospital. Amputation was applied to four patients with diabetic foot and ten patients with trauma. Five patients had three sessions, eight patients had five sessions and two patients had six sessions of EMDR applications. The treatment was ended when patients expressed that they were not in pain. Following amputation, McGill Melzack Pain Questionnaire, State Anxiety Inventory (STAI-I), the Beck Depression Inventory (BDI) and the Symptom Checklist (SCL-90-R) were applied at the end of the first week before EMDR applications and just after the EMDR applications. These tests were given to the patients who were invited to control again after one month and three months. The SCL-90-R was applied again in the third month control.

Results: It was seen that phantom pain significantly decreased before the treatment, among shortly after, one month and 3 months later controls.

Conclusion: In this study, EMDR therapy has been found to provide a significant improvement over the phantom pain. Based on the findings, EMDR therapy has been shown effective with early application on phantom pain.

Keywords: EMDR, pain, phantom pain, trauma



ÖZET

Fantom ağrılarının tedavisinde EMDR terapi etkinliğinin değerlendirilmesi

Amaç: Fantom ağrısının (FA) tedavisinde Eye Movements of Desensitization and Reprocessing (EMDR) terapisinin etkinliği araştırılmıştır.

Yöntem: Çalışmaya GATA Ortopedi ve Travmatoloji bölümünde yatan ve amputasyon uygulanmış 14 hasta alınmıştır. Dört hastaya diyabetik ayak nedeniyle, 10 hastaya ise travmatik nedenli amputasyon uygulanmıştır. Beş hastaya üç seans, sekiz hastaya beş seans ve iki hastaya da altı seans EMDR uygulaması yapılmıştır. Tedavinin sonlanması, hastaların ağrılarının olmadıklarını ifade etmeleriyle sağlanmıştır. Amputasyon sonrası EMDR uygulamasından önce erken dönemde (birinci hafta sonunda) ve uygulamadan hemen sonra Mc Gill Melzack Ağrı Soru Formu, Durumluk Kaygı Envanteri (DKE), Beck Depresyon Ölçeği (BDÖ) ve Ruhsal Belirti Tarama Listesi (Symptom Distress Checklist, SCL 90-R) uygulanmıştır. Daha sonra bir ay ve üç ay sonra kontrol muayenesine çağrılan hastalara bu testler tekrar verilmiştir. SCL 90-R ise üçüncü ay kontrolünde tekrar uygulanmıştır.

Bulgular: EMDR uygulaması öncesi, uygulama sonrası, bir ay ve üç ay sonra kontrollerde hastaların ağrılarında belirgin azalma görülmüştür.

Sonuç: Bu çalışmada, EMDR terapisinin fantom ağrıları üzerinde anlamlı bir iyileşme sağladığı saptanmıştır. Bulgulara dayanarak EMDR terapisi fantom ağrıları üzerinde erken dönem uygulamasıyla etkin görülmüştür.

Anahtar kelimeler: EMDR, ağrı, fantom ağrısı, travma

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INTRODUCTION

Many patients who have undergone amputation feel severe pain in absent parts of their extremities. This condition is known as phantom pain (PP). Some theories have been proposed to explain

initiation or development of PP, but successful treatment options are still limited (1). Pains observed after amputations may be in PP character. PP may initiate as phantom sensation and then progresses to PP. Phantom sensation generally causes no problem in patients; it is at an acceptable level, and it decreases or

vanishes by time (1,2). However, PP causes great troubles (3). Patient with PP feels pain which are generally characterized as squeezing in the lost or total of his/her extremity. It was reported in many amputated patients that Phantom sensation supported functional use of prosthesis, so patients did not complain from it, but it was difficult for them to cope with PP (4). PP may be felt all through the day or at some time intervals (such as implanting the prosthesis). It becomes generally chronic (1,5,6). It was reported that it might be a cause of suicide in some cases (1).

PP term was first used in 1872 by Mitchell (7). In 1552, Ambroise Paré assumed that peripheral factors might also cause PP as well as central pain memory, and he was the first person who defined this phenomenon (8). The mechanism of PPs which are observed in 85% of patients with amputations, and continues for months and even life-long in 50% of patients, has not been clarified yet (1,9,10). The causes of PPs have been investigated for years. It has been evaluated as psychological based pain because they occur more commonly in amputations in young patients, and after unexpected traumas (2-11). It was reported that PP might be due to specific positions or movements of the absent extremity. Pain appears due to various physical (such as weather changes or pressure on the stump) or psychological (such as emotional stress) causes (12).

The most common type of PP' character defined by patients is the burning and cramping. Additionally, PP is defined as trembling, excruciating, tearing, itching, or sharp. While pain can be felt continuously or throughout the day with different exacerbation periods, they may be felt with random intervals or rarely in some cases (13).

Psychological treatment methods such as hypnosis, biofeedback, and relaxation therapy may be used in treatment of PP in addition to pharmaco-surgical methods such as local anesthesia, sympathectomy, cordotomy, pharmacological agents, and neurostimulation. However, it was determined for long-term that none of treatment methods was superior to the others (9). It is also possible to consider amputation as a traumatic event. In that case,

interpretation ways of and coping style with traumatic event differ between subjects.

Even though diseases or injuries are successfully treated, the PPs may still be disturbing. This may be resulted from inappropriately stored memories and chronic active pains (14-17). These memories are important factors in PP, and their withdrawal may have a permanent effect on PP. Processing traumatic memories can also be an effective method to decrease emotional dimensions of pain memories at an appropriate level (16). Eye Movements of Desensitization and Reprocessing (EMDR), which aims to solve memories of especially negative experiences, is an evidence based treatment method for traumatic pains (18,19).

EMDR is an eight structured staged treatment approach including psychodynamic, cognitive behavioral, applicant base, and interventional therapy factors. Originally it has been developed to diminish troubles related to traumatic memories, but it has been used also in other diseases consequent of stressful life events (20).

In the present study, it is decided that early phase EMDR in PP treatment, which deteriorates life quality of subjects, may be used both in pain treatment of patients with amputations, and in facilitation of getting used to prosthesis. The aim of the study was to investigate efficacy of EMDR therapy in relieving post-amputation PPs.

METHOD

In the study, 14 patients who were hospitalized and amputated at Department of Orthopedics and Traumatology, in Gulhane Training and Research Hospital were included. The age range was 20-68 years with the mean of 30.53 ± 14.95 years. Of patients, 4 had amputation due to diabetic foot, and 10 had due to traumatic causes. Before amputation, patients were interviewed about socioeconomic status, age, education level, previous surgery history, and their expectations by a semi-structured general information form, and they were informed about EMDR and amputation procedure. In the early phase of post-amputation (at the end of week 1), Mc Gill Melzack Pain Questionnaire,

State Anxiety Inventory, Beck Depression Inventory (BDI), and Symptom Distress Checklist (SCL 90-R) were applied before and after EMDR. Patients, who were called for control visits one and three months later, were given these tests again. SCL 90-R was repeated at the month 3 control because of its characteristics. Patients were informed about the study, EMDR, and tests in face to face interviews. A pain specific EMDR protocol was used in the present study.

The study was approved by the local ethics committee, and informed consents were provided from all participants.

Measures

Mc Gill Melzack Pain Questionnaire: It contains four parts. In the first part, patient was requested to mark his/her pain on the body schema, and if the pain is felt deeper, he/she is requested to mark as (D); if it is felt superficial, he/she is requested to mark as (S); and if the pain is felt deeper, he/she is requested to mark as (DS). In the literature, it was reported that 62-66% of patients marked pain in one area, 17% marked in two different areas, and 9-13% marked three different areas (21). In the second part, there are 20 paired word groups which investigate pain about sensation, perception, and evaluation. Each group is consisted of 2-6 words which describe the pain from different aspects. Pain-time relationship is investigated in the third part. There are word groups which can be used to define continuity, frequency of pain, and increasing/decreasing factors. In the fourth part, there are five word groups to define pain intensity from "mild" to "intractable". Also there are six questions to define "livable= target pain", which is the pain level that the patient can accept or live without feeling uncomfortable. Each group in the scale is composed of 20 paired pain evaluating words. Patients select the related pair to their pains, and they circle the best defining letter for their pains in the group. Both groups have word numbers of 2-6, which describe intensity level of the pain. The first 10 pairs are perceptual, consequently the five pairs are sensational, and 16 pairs are for evaluation. The last four pairs are

composed of different words. Score of each part forms the total score (22). The validity and reliability study of this scale has been performed for our country (23).

State Anxiety Inventory: State Anxiety is transient emotional reactions of individuals to not commonly encountered events with changing intensity according to situations. If the subject perceives the stressful condition as threatening, it is high, and if the subject perceives the stressful condition as non-threatening, it is low in intensity. It measures the anxiety level of the subject at the state, namely in the present time (24,25).

Beck Depression Inventory: this scale developed by A.T. Beck is used to determine depression level and differentiate between depression and other psychopathological conditions (26). The higher the obtained score, the higher the intensity of depression. The highest attainable score is 63 points. Its validity and reliability study has been performed for our country (27).

Symptom Distress Checklist (SCL 90-R) is a test to determine symptoms of psychological troubles. SCL 90-R is a screening questionnaire developed by Degoratis (28). This scale is a screening tool for symptom level evaluating difficulty degree of the subject or unfavorable stress reaction level in the last month. It concludes ten symptoms groups. These are somatization, obsessive-compulsivity, interpersonal sensitivity, depression, anxiety, anger-hostility, phobic anxiety, paranoid thoughts, psychotism, and additional items. The scale is filled up by the patient giving points between 0 and 4. Validity and reliability study of the scale has been performed in our country. In the reliability study of Turkish version of the scale, reliability coefficient for test-retest performed by addition of scores of high school students, was $r=0.83$ (29). It was reported in the same study that reliability coefficients for test-retest of subscales in university student group was between 0.63 and 0.84. Dag (30) reported by using data obtained from university students that test-retest coefficients of subscales were between $r=0.75$ and 0.87.

Cronbach's alpha coefficient of all of the scale was calculated as $\alpha=0.96$, values changing between $\alpha=0.64$ and 0.85 were calculated for subscales.

EMDR Protocol

Applicant history: Information such as pain history, onset of pain, pain progression, duration etc. familial condition, life supports were collected. Sources of symptoms and problems and future targets were determined. Treatment plan was set up.

Evaluation: Patient was informed about EMDR. It was told that pain was originated from blockage of information, emotion and thoughts in the mind, and information, emotion, and thoughts related to pain could be re-processed by solving these blockage via bidirectional stimulation.

Preparation: Therapist helped the patient in determining picture representing pain (forming of pain such as type, intensity, smell or heat), interpreting his/her belief about effects of pain on his/her life and personality, emotions in his/her body and their locations, and positive belief that he/she would like to have. In this part, pain level was evaluated by a Subjective Units of disturbance (SUD) scale ranging between 0 and 10 points. Also, degree of positive belief was evaluated by Validity of Cognition-(VOC) rating between 1 and 7 points.

Desensitization: This stage was started with concentration of the patient on a picture chosen to represent the memory, and on his/her negative belief, living the emotions he/she was feeling, and sensation in his/her body. Bidirectional stimulants were given. The process was continued until the memory and patient's negative believes did not disturb him/her anymore.

Replacement: Positive belief of the patient was stiffened. When it was ensured that the patient could cope with the pain as it was wished, therapy was gradually discontinued.

Body screening: It was provided that the patient did body screening, and in case of any uncomfortable sensation, it was processed.

Closure: Therapist gave positive feedbacks to the patient. Therapist told the patient what he/she could live after the session.

Re-evaluation: Previous session was evaluated. Therapist controlled whether positive outcomes reached in the previous session were replaced. Real expectations were formed, positive changes were enhanced. Depending on this, processing period was either continued or stopped (31).

Statistical Analysis

Variation analysis tests were performed in statistical analysis, and the level of significance was accepted at $p<0.05$. Data were evaluated by using Windows SPSS 15.0 program.

RESULTS

Variation analysis consistent with repetitive measurement pattern was performed to determine whether there was any differences in Mc Gill Melzack Pain Questionnaire, BDI, and SAI scale scores before and immediately after, at the end of month 1 and 3 of EMDR application. For SCL 90-R scale, the difference was analyzed before and at the end of month 3 after EMDR application (Table 1).

EMDR application was performed 3 sessions in 5 patients, five sessions in 8 patients, and six sessions in 2 patients. At the end of treatment, all patients reported that they had no pain.

Statistically significant differences were determined in Mc Gill Melzack Pain Questionnaire scores before and after EMDR application (immediately after, and in post-application month 1 and 3) ($F_{3,39}=103.626$; $p<0.05$). According to significance measurements performed by using Tukey test, the difference between the first application

Table 1: The mean and standard deviation values of scores obtained from scales before and after EMDR

	Before EMDR mean±SD	After EMDR mean±SD	1 month after EMDR mean±SD	3 months after EMDR mean±SD	WIL	F	p
Mc Gill Melzack Pain Questionnaire	7.07±1.50	0.57±1.40	0.78±1.30	0.07±0.30	0.036	103.626	<0.001
SAI	43.21±4.30	45.50±3.00	46.00±4.00	43.35±3.60	0.570	2.970	0.04
BDI	15.28±8.20	7.21±6.20	4.43±4.60	3.42±4.10	0.227	28.565	<0.001
Subscales of SCL 90-R							
SCL Somatization	2.20±2.60			0.35±0.76	0.667	6.500	0.02
Obsessive Compulsive Symptoms	1.60±1.40			0.38±0.64	0.598	8.729	0.01
Interpersonal Sensitivity	1.70±1.50			0.61±0.76	0.566	9.953	<0.001
Depressive Symptoms	1.90±2.30			0.30±0.70	0.667	6.476	0.02
Anxiety	1.80±2.00			0.87±1.50	0.655	6.832	0.02
Anger and Hostility	1.80±2.40			0.80±1.50	0.892	1.579	0.23
Phobia	2.20±2.60			0.40±0.90	0.698	5.632	0.03
Paranoid Symptoms	1.60±1.50			0.20±0.60	0.530	11.518	<0.001
Psychotism	1.60±1.60			0.40±1.00	0.687	5.931	0.03
Additional Scale	1.60±1.00			0.20±0.50	0.253	38.449	<0.001
General Evaluation	1.60±2.00			0.90±1.80	0.942	0.799	0.40

SD: Standard deviation

(mean=7.07; SD=1.5) and in the last one in month 3 (mean=0.07; SD=0.3) was statistically significant. There was a statistically significant difference between the first and the second applications (mean=0.6; SD=1.4). However differences between the second and third (mean=0.8; SD=1.3) and between the third and the fourth (mean= 0.07; SD=0.3) applications were determined insignificant. According to scores obtained from tests, it could be claimed that pains were decreased immediately after EMDR (Table 1).

There was a statistically significant difference in SAI scores before and after EMDR (immediately, 1 month, and 3 months after) ($F_{3,39}=2.97$; $p<0.05$). According to results of comparison between groups performed by using Tukey test, there were statistically significant differences between all applications. Thus, it can be claimed that EMDR application has effects on state anxiety of patients with PPs (Table 1).

There were statistically significant differences in BDI scores before, immediately after, and after 1 and 3 months of EMDR application ($F_{3,39}=28.565$; $p<0.05$). According to results of intergroup comparisons by using Tukey test, there were statistically significant differences between all applications. Depending scores obtained from the test, it can be claimed that there is marked decrease in depression measurement scores of

patients who have received EMDR application (Table 1).

Statistically significant difference was determined in somatization subscale of SCL 90-R scale, which was performed before, and 3 months after EMDR application ($F_{1,13}=6.5$; $p<0.05$). According to intergroup comparisons performed by using Tukey test, there was a statistically significant difference between the first application (mean=2.2; SD=2.6) and the second application (mean=0.35; SD=0.76). Depending on scores obtained from the test, it can be claimed that somatic symptoms are decrease in patients who have received EMDR application (Table 1).

There were statistically significant differences in subscale scores of obsessive-compulsive symptoms ($F_{1,13}=8.729$; $p<0.05$). According to intergroup comparisons performed by using Tukey test, the difference between the first application (mean=1.6; SD=1.4) and the second application (mean=0.38; SD=0.64) was significant. Therefore, it can be claimed that obsessive compulsive behaviors of patients who have received EMDR application are decreased (Table 1).

There was a statistically significant difference in scores of the subscale interpersonal sensitivity ($F_{1,13}=9.953$; $p<0.05$). According to intergroup comparison results performed by using Tukey test, the difference between the first application

(mean=1.7; SD=1.5) and the second application (mean= 0.61; SD=0.76) was significant. Therefore, it can be claimed that social adaptation is improved in patients who have received EMDR application (Table 1).

There was a statistically significant difference between depression subscale scores ($F_{1,13}=6.476$; $p<0.05$). According to results of intergroup comparisons performed by using Tukey test, there was a statistically significant difference between the first (mean=1.9; SD=2.3) and the second applications (mean=0.3; SD=0.71). Therefore, it can be claimed that differences are observed in depression subscale in patients who have received EMDR application (Table 1).

Statistically significant difference was determined between scores of anxiety subscale ($F_{1,13}=6.832$; $p<0.05$). According to results of intergroup comparisons performed by using Tukey test, the difference between the first (mean=1.8; SD=2) and the second applications (mean=0.87; SD=1.5) was determined as significant. Therefore, it can be claimed that anxiety symptoms are decreased in patients who have received EMDR application (Table 1).

No statistically significant difference was determined between scores obtained from anger and hostility subscale ($F_{1,13}=1.579$; $p<0.05$). According to results of intergroup comparisons performed by using Tukey test, there was no significant difference between the first (mean=1.8; SD=2.4) and the second application (mean=0.8; SD=1.5). Therefore, no difference is observed in anger hostility values of amputated patients who have received EMDR (Table 1).

Statistically significant difference was determined between scores of phobia subscale ($F_{1,13}=5.632$; $p<0.05$). According to results of intergroup comparisons performed by using Tukey test, there was a statistically significant difference between the first (mean=2.2; SD=2.6) and the second applications (mean=0.4; SD=0.9). Therefore, it is observed that phobic symptoms of patients who have received EMDR application (Table 1).

There was a statistically significant difference between scores of paranoid characteristics subscale ($F_{1,13}=11.518$; $p<0.05$). According to results of intergroup comparisons performed by using Tukey test,

the difference between the first (mean=1.6; SD=1.5) and the second applications (mean=0.2; SD=0.6) was significant. Therefore, it can be claimed that paranoid thoughts are markedly decreased in patients who have received EMDR application (Table 1).

There was a statistically significant difference between scores obtained from psychotism subscale ($F_{1,13}=5.931$; $p<0.05$). According to intergroup comparisons performed by using Tukey test, the difference between the first (mean=1.6; SD=1.6) and the second applications (mean=0.4; SD=1) was statistically significant. Therefore, it can be said that there are changes about psychotic symptoms related to the event in patients who have received EMDR application (Table 1).

There were significant differences between scores obtained in additional scale ($F_{1,13}=38.449$; $p<0.05$). According to results of intergroup comparisons performed by using Tukey test, the difference between the first (mean=1.6; SD=1) and the second applications (mean=0.2; SD=0.5) was significant. Therefore, it can be said that symptoms related to sleeping and eating disorders are markedly decreased in patients who have received EMDR application (Table 1).

When general examination of SCL-90-R test was evaluated, there was no statistically significant difference between scores before and three months after EMDR applications ($F_{1,13}=0.799$; $p<0.05$). According to results of intergroup comparisons performed by using Tukey test, the difference between the first (mean=1.6; SD=2) and the second applications (mean=0.9; SD=1.8) was not significant (Table 1).

DISCUSSION

EMDR application was performed to relieve PPs within the first week after amputation in a total of 14 patients (4 were amputated due to diabetic foot, and 10 were due to trauma). It was determined that PPs were decreased, state anxieties were improved, depressive symptoms were decreased significantly, and there were significant differences in all subscales except anger-hostility subscale of SCL-90-R in all patients after EMDR treatment.

In the present study, marked decreases were determined in depressive symptoms and state anxiety in patients who received EMDR therapy. It is believed that decrease in depressive symptoms are related to rapid information processing method of EMDR. Wilson et al. (32) also reported that symptoms of depression and anxiety were markedly improved after the first or second EMDR application. Therefore, it is considered that EMDR resolves the blockage in information processing system after traumatic events. It helps to process information so that a solution is reached in consistent with compliance. Therefore, EMDR is effective in depressive symptoms and state anxiety.

Grant and Threlfo (33) tried to explain relief of pain in their article related to EMDR application in chronic pain. Schneider et al. (9) tried to explain relief of pain in their article about PP by using Shapiro's compliance information processing model (CIP). According to this model, nociceptive sensation and emotional reaction are related. During a traumatic event, the painful stimulus is stored both physically, and as an image, thought, and affect. Therefore, traumatic memories include cognitive awareness as well as affective factors, and they may contribute markedly in stress with chronic pain. Re-processing of these problematic memories, which have been stored dysfunctionally, will enable problematic memories to integrate, and it will lead symptom recovery and increase in personal competence. According to CIP model, perception related to the traumatic event is re-processed by bidirectional stimulation with its somatic and affective components, and cortical integration of the memory is provided. Change in emotional dimension of pain causes changes in pain routes, so it may remind pain to the nervous system, and change its reproduction (19).

The proposed hypothesis was that if the patient had normal response to pain or stress by providing emotional desensitization against stress, then there would be no pain which was exaggerated by the limbic system, unless there was a new trauma (16). Accordingly, as EMDR treatment focuses on emotional factors as much as somatic and cognitive components of traumatic experience, it stimulates more stable

changes, and thus it is markedly more beneficial than conventional treatment approaches, which are not interested in emotional dimension of pain.

When somatization subscale scores of SCL 90-R scale were investigated in the present study, it was observed that they were consistent with the literature (34). As patients were diabetics and had trauma, it was thought that they were focused on integrity of their own bodies. There was a significant difference in the second measurement performed three months later. This findings suggest that EMDR application may be effective under such conditions. However, it should not be undervalued that progression to prosthesis stage with physical recovery contributes in the change.

Obsessive-compulsive symptoms subscale scores were high at the first application after amputation. The effects of traumatic events on obsessive compulsive symptoms were also investigated, and statistically significant correlations were determined both in Obsessive Compulsive Disorder (OCD) with patients and non-clinical sample between obsessive compulsive symptoms and childhood traumas (35,36). It was suggested that thoughts related to trauma might be converted to obsession (37) after some time. According to cognitive approach, a clinically meaningful obsession is originated from less severe and disturbing thoughts (38). In that case, it seems to be possible that some thoughts, which are based on traumatic life content, may be converted into clinical obsessions. In addition, it is believed that traumatic events may have a triggering role in conversion of non-disturbing thoughts to obsession. In the present study, it was observed that obsessive-compulsive symptom scores were significantly decreased after EMDR application. Similar to our findings, Von Knorring et al. (39) reported the successful application of EMDR on the treatment of anxiety disorders (OCD, TSPD etc).

In the interpersonal sensitivity subscale, it was observed that scores were increased before EMDR. In addition to physical injury, the subject believes that he/she is inadequate and dependent in interpersonal relationships, when he/she compares him/herself with others, and these may cause reflection of negative thoughts and emotions. Meanwhile, as patient is

introverted, the social support may be negatively by the patient (40). It is observed at the second application performed at end of month 3 that EMDR application may help the patient to reduce negative emotions and thoughts related to him/herself.

There was no difference in anger-hostility subscale scores between before and after EMDR application, and they were determined high in both measurements. This finding suggested that patients do not feel anger and hostility related to diabetes disease and traumatic life events, but this may be related to feeling of anxiety only due to amputation. This finding is also supported by the absence of any psychiatric disorders in these patients. According to Henning and Frueh (41), thought about trauma related to anger might trigger experiencing of the trauma. Therefore, there might be a high correlation between intensity of anger and severity of stress disorder symptoms.

It was observed that patient scores were high in phobic symptoms subscale scores, they were significantly decreased at month 3 measurements after EMDR application. Trauma origin phobia has a prominent initiation for patients. This fear is caused by a stressful and dramatic experience. Amputation is also a traumatic event. Therefore, it is natural that they fear of what would happen to them. EMDR application can be accepted as one of the first selected treatment options to work or to desensitize with memories causing fear (42). EMDR may lead changes on anxiety while resolving the traumatic memories (14).

Scores in paranoid thought subscale was high in our study. In his study Parson (43) was reported that subjects might have paranoid thoughts after trauma, and also personality disorders may be observed in subjects with chronic TSPD. Paranoid thoughts are decreased in our study by EMDR application. This finding suggests that this technique has effects on these thoughts.

Significant differences have been reported after accidents in psychoticism symptom subscale. Klaric et al. (34) reported that psychoticism symptoms were frequently encountered in traumatized subjects. In the

present study, psychotic symptoms have not been observed at the second evaluation, which was 1 month after amputation, and thus it is believed that EMDR has decreased these symptoms.

Significant differences have been encountered in additional scale subscale (sleeping, nutrition problems etc.) measurements between before and after EMDR. According to Shapiro (44), eye movements may stimulate similar processes which appear during REM sleep. There are studies which have reported that REM sleep periods are not functional in traumatized patients (45,46). According to Shapiro (19), this results is consistent with the approach proposing that cognitive processing or mental functioning is related to eye movements.

The present study is the most comprehensive study about this subject because of its large sample size. It is believed that marked improvements in signs have been caused by early phase EMDR application. Therefore, patients can more effectively spend their time to get used to their prosthesis and coping with the daily life. It is observed that EMDR therapy has soothing effects on pains of amputated patients by stimulating many mechanisms of action in the nervous system. Particularly in surgery clinics, early phase, postoperative EMDR application may have beneficial results for patients.

Contribution Categories	Name of Author
Development of study idea	E.S.
Methodological design of the study	E.S.
Data acquisition and process	E.S.
Data analysis and interpretation	E.S.
Literature review	E.S.
Manuscript writing	E.S.
Manuscript review and revision	E.S.

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