

Efficacy of the Eye Movement Desensitization Procedure in the Treatment of Traumatic Memories

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The aim of the study was to determine the effectiveness of the recently developed Eye Movement Desensitization (EMD) procedure on traumatic memory symptomatology. Twenty-two subjects suffering from symptoms related to traumatic memories were used in the study. All had been victims of traumatic incidents concerning the Vietnam War, childhood sexual molestation, sexual or physical assault, or emotional abuse. Memories of the traumatic incident were pivotal to the presenting complaints which included intrusive thoughts, flashbacks, sleep disturbances, low self-esteem, and relationship problems. Dependent variables were (1) anxiety level, (2) validity of a positive self-statement/assessment of the traumatic incident, and (3) presenting complaints. These measures were obtained at the initial session and at 1- and 3-month follow-up sessions. The results of the study indicated that a single session of the EMD procedure successfully desensitized the subjects' traumatic memories and dramatically altered their cognitive assessments of the situation, effects that were maintained through the 3-month follow-up check. This therapeutic benefit was accompanied by behavioral shifts which included the alleviation of the subjects' primary presenting complaints.

KEY WORDS: memories; trauma; desensitization; PTSD; anxiety; rape/molestation; combat.

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INTRODUCTION

Strong interest in post-traumatic stress disorder (PTSD) was brought to the forefront by the treatment of Vietnam veterans (Figley, 1978). At the same time, the feminist movement forced a reevaluation of the treatment of rape victims (Largen, 1976), so that rape is listed second only to combat in the DSM III categorization of PTSD.

It is well accepted that the response to memories of specific traumatic events is the primary factor in the manifestation of PTSD-related symptoms (Keane *et al.*, 1985). In treating the specific memories, behavior modification exposure techniques such as Systematic Desensitization (Wolpe, 1958) and flooding (Stampfl and Levis, 1967) have been used (Fairbank and Keane, 1982). However, both of these procedures are hampered by serious drawbacks in their clinical use.

Systematic Desensitization (SD) which has proven quite efficacious in reducing or eliminating phobias, entails a process by which the anxiety-producing cues are ranked according to levels of subjective disturbance. The lowest ranking cues are then introduced for approximately 6 sec, followed by a period of intense relaxation. While counter conditioning and extinction have been posited as the controlling mechanisms in this procedure (cf. Kazdin and Wilcoxon, 1976), Wolpe (1954) argues that the state of relaxation is incompatible with the state of anxiety and the phobic cue is thereby desensitized by means of reciprocal inhibition.

According to Wolpe (1954, 1982), in order for desensitization to be effective, prolonged training in deep relaxation (approximately nine sessions) is required and only low levels of disturbance are amenable to the treatment in each session. Thus, many sessions are necessary to proceed through the hierarchy before the goal of desensitizing the total anxiety response is achieved. Perhaps because of the number of relaxation and desensitization sessions necessary, or because the traumatic cues associated with a rape or many Vietnam incidents are not amenable to hierarchical arrangement, SD has not found more widespread use in the treatment of PTSD.

With flooding it is possible to address traumatic events at a high level of disturbance. However, as with SD there are certain problems with this procedure. During the implementation of flooding, the client is asked to relive the event in exaggerated detail which produces intense anxiety throughout the sessions. Between five and nine sessions are usually required to eliminate the anxiety. Therefore, while this procedure can be effective, there continues to be an expressed concern in the therapeutic community regarding the forced elicitation of such high anxiety in clients for prolonged periods (Fairbank and Brown, 1987). In addition, flooding (as well as SD) has been criticized for failing to address irrational cognitions or to offer

generalizable coping skills (Becker and Abel, 1981; Kilpatrick *et al.*, 1982; Kilpatrick and Best, 1984). Consequently, cognitive therapy techniques have been used to supplement the behavioral techniques in order to reorient clients toward self-acceptance.

The consensus in the behavioral community is that both cognitive and exposure techniques are necessary for the treatment of traumatic memories. However, the difficulties already discussed regarding SD and flooding indicate a treatment need for a desensitization procedure that can address highly traumatic incidents in a short period of time without exacerbated anxiety on the part of the victim while at the same time incorporating a cognitive reconstruction.

The investigator has developed a technique, the Eye Movement Desensitization (EMD) procedure, which on the basis of clinical observation appeared to be extremely promising in the treatment of traumatic memories and stress-related symptoms. The primary component of the EMD procedure is the generation of rhythmic, multi-saccadic eye movements while the client concentrates on the memory to be desensitized. The effect of saccadic eye movements was discovered accidentally by the author when she noticed that recurring, disturbing thoughts were suddenly disappearing and not returning. Careful self-examination ascertained that the apparent reason for this effect was that the eyes were automatically moving in a multi-saccadic manner while the disturbing thought was being held in consciousness. The effect was that the thought disappeared completely and if deliberately retrieved was without its previously disturbing emotional correlate. The author then began to make systematic use of these movements to study the effect and later proceeded to generate the saccades in a large number of volunteers and clients in order to investigate further the therapeutic possibilities. The EMD procedure examined in the present study thus evolved from the clinical observations garnered during hundreds of treatment sessions.

In the EMD procedure clients are requested to follow with their eyes the therapist's finger, which is moved very rapidly from side to side 10-20 times as a means of eliciting from them rhythmic, bilateral saccadic eye movements, while they simultaneously visualize the traumatic event and internally repeat the associated irrational cognition or negative self-statement (i.e., self-assessment). Preliminary testing suggested that the procedure had the capacity to (1) desensitize a highly traumatic memory within a short period of time (one session) without intense and prolonged anxiety; (2) produce a cognitive restructuring of the verbalized self-statement or assessment, along with a redefined visual representation; and (3) cause congruent and substantial behavioral shifts.

Since the preceding observations were anecdotal, the present study was carried out to examine the efficacy of the EMD procedure in a systematic and controlled manner.

METHOD

Design

Twenty-two volunteer subjects suffering from traumatic memories were randomly divided into a Treatment Group, which received the EMD treatment, and a Control Group, which received a placebo treatment. Each group was measured before, during, and after their respective treatments on anxiety level and belief in the validity of the desired cognition concerning their traumatic memory. Also measured were the subject's presenting complaints. Identical statements, questions, and number of measurements were used for both groups in order to control for subjects' expectations and other placebo effects, and for the possibility that mere exposure to the traumatic incident would cause desensitization.

For ethical reasons, the EMD procedure was administered to the Control Group after they had participated in the placebo condition. While affording treatment to the Control Group prevented a between-groups analysis of follow-up results, it did provide the opportunity for a within-groups analysis in which the Control Group after the placebo was compared to the same group after the EMD procedure (delayed treatment condition).

Follow-up tests of the effectiveness of the treatment were obtained at 1 and 2 months after the initial session.

Subjects

Five males and 17 females served as subjects. All were volunteers referred from (1) the Mendocino, CA Community Assistance in Assault and Rape Emergency (CAARE) Project which treats rape/assault/molestation victims; (2) the Parents United Group, which treats adult survivors of childhood molestations; (3) the Fort Bragg, CA, Vietnam Veterans Outreach Program; or (4) independent therapists.

All referrals were previously diagnosed by their counselors as PTSD victims. An additional five subjects were mental health professionals who desired relief from traumatic memories that continued to cause them distress (e.g., intrusive thoughts, nightmares, intimacy problems). Subjects' ages ranged from 11 to 53 years, with a mean of 37 years. They came from all walks of life, including unemployed blue collar workers, professional mental health workers, and a psychiatrist. Education level was congruent with employment (i.e., ranged from elementary school education to postgraduate studies).

All referrals were accepted as subjects based upon the criteria of a long-standing (i.e., 1 or more years) traumatic memory and related symptoma-

tology (e.g., flashbacks, intrusive thoughts, sleep disturbances, intimacy problems). One subject had undergone severe mental and physical abuse, while all others had experienced either rape/molestation or Vietnam War combat incidents. The number of years that these traumatic memories had persisted ranged from 1 to 47 years, with a mean of 23 years. The length of therapy ranged from 2 months to 25 years, with a mean of 6 years. Other symptoms and their frequencies were: flashbacks (range = 1/month-6/week; mean = 3/week); intrusive thoughts (range = 5/week-6/day; mean = 12/week), and sleep disturbances (range = 2/week-5/week; mean = 4/week).

Measurements

The dependent variables were anxiety level, belief in the validity of the desired cognitions, and presenting complaints.

The level of anxiety related to the traumatic memories was assessed by means of an 11-point (0 = no anxiety; 10 = highest anxiety possible) Subjective Units of Disturbance scale (SUDS; Wolpe, 1982). This instrument has been found to correlate with objective physiological indicators of stress (Thyer *et al.*, 1984) and is customarily used to assess anxiety level during the SD procedure. Pulse rates were also recorded in order to monitor any undue disturbance on the part of the subject.

Irrational cognitions are a part of PTSD and cognitive therapy serves to restructure these beliefs (DeFazio *et al.*, 1975; Keane *et al.*, 1985). Therefore, the second quantitative measurement entailed first eliciting from subjects the words that best described their irrational belief about the traumatic memory, then asking them to verbalize the belief that they desired as a replacement, and finally, while concentrating on the traumatic memory, to indicate on a 7-point (1 = completely untrue; 7 = completely true) Semantic Differential scale the current strength of this alternate belief. With regard to the latter, subjects were instructed to respond in terms of their "gut feelings" rather than their intellect. This measure, which was created by the author, is referred to as the Validity of Cognition scale and was assumed, on the basis of its face validity, to provide a rapid assessment of cognitive structure.

The subjects' presenting complaints were also used as an index of potential therapeutic effectiveness. At the initial session subjects were interviewed regarding presenting symptoms including flashbacks, intrusive thoughts, and sleep disturbances, and their frequency during the preceding month. These were used as baseline data and were corroborated by therapists, spouses, and parents. The primary presenting complaints for each of the subjects are listed in Tables I and II of "Results."

Procedure

At the outset of the 50-min initial session (Session 1), subjects in both Treatment and Control Groups were requested to read and sign a release form, indicating that, although "not guaranteed," their participation in the experiment might have "possible benefits" for their specific complaints. They were asked to enumerate and quantify their presenting complaints (e.g., number of intrusive thoughts during the preceding week). They were then instructed to describe the memory from which they wished relief in terms of who was involved and what had happened. They were asked to isolate a single picture that represented the entire memory (preferably the most traumatic point of the incident) and to indicate who and what was in the picture.

In order to assess their belief statement about the incident, they were then asked "What words about yourself or the incident best go with the picture." Most subjects expressed such belief statements as "I am helpless," "I should have done something," or "I have no control." If the subject experienced difficulty in generating an assessment statement, the investigator provided assistance by explaining the concept of negative self-assessments and gave examples. Alternatively, the researcher might ask them to describe their feelings about the past incident and then suggest some alternatives. Only those belief statements that were recognized by the subjects as applicable to them and the incident were used, and where possible the subjects' own words were quoted.

Subjects were then directed to imagine both the traumatic scene and the words of the belief statement and to assign a SUDS level to them. They were then asked how they would like to feel instead and to supply a new belief statement that reflected the desired feeling (e.g., "I have control," "I am worthy," "I did the best I could"). The subjects were then requested to judge by means of the 7-point Validity of Cognition scale how true the new statement felt to them and this response was recorded.

Next, subjects were told that: "What we will be doing is often a physiology check. I need to know from you exactly what is going on with as clear feedback as possible. Sometimes things will change and sometimes they won't. I may ask you if the picture changes — sometimes it will and sometimes it won't. I'll ask you how you feel from '0' to '10' — sometimes it will change and sometimes it won't. I may ask if something else comes up—sometimes it will and sometimes it won't. There are no 'supposed to's' in this process. So just give as accurate feedback as you can as to what is happening, without judging whether it should be happening or not. Just let whatever happens, happen."

Treatment Group

Subjects in the Treatment Group were instructed to visualize the traumatic scene, rehearse the negative statement (e.g., "I am helpless"), and follow the investigator's index finger with their eyes. The investigator then caused subjects to generate a series of 10-20 voluntary, bilateral, rhythmic saccadic eye movements by moving her index finger rapidly back and forth across their line of vision. The finger was located 12-14 in. from the face and was moved from the extreme right to the extreme left of the visual field at the rate of two back-and-forth sweeps per second. The distance of one sweep was approximately 12 in. The investigator's finger moved either (1) in a diagonal across the midline of the face from the subjects' extreme lower right to extreme upper left (i.e., chin-level to contralateral brow-level) or (2) horizontally at mid-eye level from the extreme right to extreme left of the subjects' visual field.

Two of the subjects were unable to follow the moving finger and thus for these subjects the investigator used a two-handed approach in which she placed the index finger of each hand on opposite sides of the subject's face at eye level and alternately lifted each finger. The subject was instructed to move the eyes to the raised finger which was at the extreme left or right limit of the visual field.

Each grouping of 10 to 20 two-directional saccadic eye-movements is considered to be one set. After each set of saccades, the subjects were asked to: "Blank it (the picture) out, and take a deep breath." They were then asked to bring up the picture and words again, to concentrate on the anxiety level generated, and to provide a SUDs level rating from "0" to "10." At the times that the SUDs levels were taken, subjects were occasionally asked such questions as "Did the picture change?" or "What do you get now/Does anything else come up?" Their answers were used as barometers of change since they often revealed new insights, perceptions, or alterations of the picture (e.g., "The picture seems further away"; "I didn't do anything wrong"). If an answer revealed that a new associated limiting belief had arisen, this belief was often included with the original statement during the next set.

When the SUDs level reached "0" or "1" (after 3-12 sets of saccades), the subject's belief in the validity of the desired cognition was tested by asking: "How do you feel about the statement (desired cognition) from '1' — completely untrue to '7' — completely true." The EMD procedure was terminated only when no other trauma or competing cognition was revealed and self-reported anxiety level was at "0" or "1." In five cases, anxiety was found to be reduced but validity of cognition had not reached "6" or "7."

In these cases, two or three additional sets of eye movements, while pairing the previously traumatic memory with the positive self-statement, were sufficient to raise validity of cognition to the desired level.

If another memory and/or cognition was determined to be interfering, the entire procedure was repeated on the new material. The latter situation is exemplified in the case of the Vietnam veteran who was working to accept as valid the cognition: "I can be comfortably in control." When asked to respond to the validity of the statement after the original image had been desensitized, he responded: "I am not worthy to be comfortably in control." This cognition of "lack of worth" was related to a different trauma which needed to be desensitized, and then still another trauma was revealed having to do with "failure." When these two additional traumas were desensitized, he was able to give a "7" rating to the words: "I can be comfortably in control."

Control Group (Placebo Condition)

In order to match the two groups on exposure to the traumatic memory, subjects in the control group were asked to describe the memory (with an emphasis on the specific traumatic scene) in full detail, indicating who was involved, what the environment looked like, and exactly what happened. This provided a modified flooding procedure. During the description, the investigator interrupted the subjects seven times at approximately 1-1 1/2-min intervals to ask for a new SUDs level (i.e., How does it **feel now from "0" to "10?"**). **This paralleled the** procedure for the Treatment Group subjects who had been interrupted 3-12 times to obtain these measurements. As with the Treatment Group, subjects in the Control Group were then asked if the picture had changed or if anything new was coming to mind. After they answered the questions they resumed the detailed description of their memory.

Following the seventh measure of the SUDs level, the statement was checked on the Validity of Cognition scale which completed the control procedure.

Finally, in order that the Control Group receive the presumed benefit of the therapy, the EMD procedure was administered in exactly the same fashion as for the Treatment Group and is referred to as the delayed treatment condition.

Thus, before treatment was administered, the Treatment Group and the Control Group were comparable on (1) initial expectancy of the treatment's effectiveness, (2) exposure to the traumatic memory, (3) occurrence of repeated interruptions and identical questioning, and (4) number of SUDs and Validity of Cognition measurements obtained. They differed in that only the Treatment Group (1) held the desired cognition along

with the traumatic memory in mind, (2) engaged in repeated eye movements, and (3) blanked out the memory and took a deep breath at the end of a given set of eye movements. This complex of events thus represents the EMD procedure.

Follow-Up

One and three months after Session 1, subjects were rescheduled for 1/2-hr interviews (1- and 3-Month Follow-Up Sessions) in order to measure the long-term effects of the treatment. They were asked to visualize the original traumatic memory and to give a SUDs rating regarding the anxiety generated by it. The positive belief statement that had been used at Session 1 was then repeated to them and they were asked to provide a rating on the Validity of Cognition scale. The subjects' previous complaints regarding intrusive thoughts, sleep disturbances, psychological numbing, etc. were reviewed and a new assessment given by them regarding intensity/severity of these complaints (e.g., numbers of intrusive thoughts, nightmares, etc.) over the preceding month. In most cases (i.e., 18 out of 22) subjects' reports were verified by therapist, spouse, or parent.

RESULTS

The efficacy of the treatment procedure was measured in terms of (1) SUDs level, (2) validity of cognition, (3) pulse rate, and (4) presenting complaints.

Subjective Units of Disturbance (SUDs)

Group means for the SUDs measures obtained in Session 1 are presented in Fig. 1. As indicated under "Procedure," the Control Group was first tested in the placebo condition and subsequently in the delayed treatment condition (also referred to in Fig. 1 as Control A and Control B). The first analysis entailed a comparison of SUDs scores for Treatment and Control A. The data for Session 1 were subjected to a Treatment/Control x Pre/Post analysis of variance with repeated measures on the second factor. Both main effects were statistically significant, although it is clear from an examination of Fig. 1 that the most important result was the interaction, $F(1, 20) = 44.46$, $p < 0.001$. A simple effects analysis revealed that the interaction was due to a highly significant ($p < 0.001$) pre-post drop in the SUDs level for the Treatment Group and no pre-post change ($p > 0.05$) for the Control Group.

In order to examine the effect of treatment on the Control Group, a Placebo/Delayed Treatment x Pre/Post analysis of variance was carried

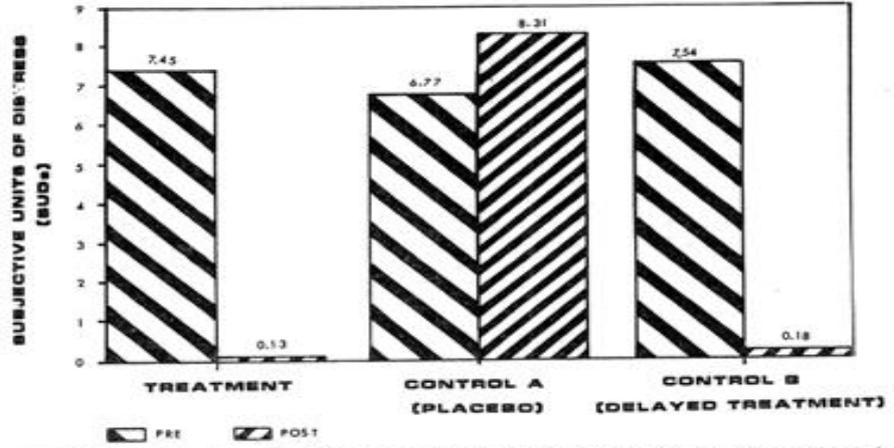


Fig. 1. Mean subjective units of disturbance for Treatment, Control A (placebo) and Control B (delayed treatment) groups in Session 1.

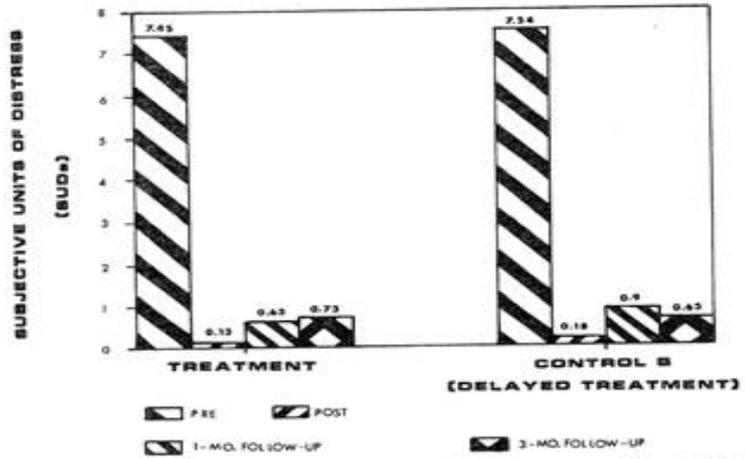


Fig. 2. Mean subjective units of disturbance for Treatment and Control B (delayed treatment) groups in Session 1, and 1-month and 3-month follow-up.

out. A statistically significant interaction, $F(1, 10) = 39.52, p < 0.001$ was obtained which, according to simple effects analyses, was due to a highly significant ($p < 0.001$) pre-post decline in SUDs level for the delayed treatment condition. As indicated in the previous analysis, the pre-post difference for the Control Group was nonsignificant ($p > 0.05$).

Figure 2 presents the mean SUDs levels for the Treatment Group and Control (delayed treatment) Group for Session 1 and 1- and 3-month Follow-Up Sessions. These data were subjected to a 2 x 4 analysis of variance in which the first factor was Treatment/Delayed Treatment and the second was Session 1 Pre/Session 1 Post/1-Month Follow-Up/3-Month Follow-Up. A statistically significant effect was obtained for the second factor, $F(3, 57) = 132.55, p < 0.001$. Simple effects analyses indicated that for neither the Treatment nor the Control Group (delayed treatment) were the differences among the post-, 1-Month Follow-Up, or 3-Month Follow-Up measures statistically significant ($p > 0.05$). Thus, as seen in Fig. 2, the significant main effect resulted from a very sharp pre-post decline in SUDs level in Session 1 for both Treatment and Control Groups, with levels remaining essentially the same through the 3-month Follow-Up.

Validity of Cognitions

The mean validity of cognition scores for Treatment, Control A (placebo condition), and Control B (delayed treatment condition) Groups are presented in Fig. 3. The data for Treatment and Control A Groups were subjected to a Treatment/Control A x Pre/Post analysis of variance. The interaction was statistically significant, $F(1, 19) = 43.193, p < 0.001$. Simple effects analyses indicated that the pre-post increase in validity of cognitions for the Treatment Group was highly statistically significant ($p < 0.001$), while the difference for the Control A Group was non-significant ($p > 0.05$). Also revealed by these analyses was a statistically significant difference between the Treatment and Control A Groups ($p < 0.05$) on *pretreatment* validity of cognition. This was unexpected, in that the two groups were treated identically through the pretreatment condition and is apparently due to chance. Reexamination of the data indicated that the difference was apparently due to one subject in the Treatment Group who began with the maximum validity of cognition score.

In order to examine the effect of treatment on the Control Group (right two-thirds of Fig. 3), a Placebo/Delayed Treatment x Pre/Post analysis of variance was carried out. The statistically significant interaction, $F(1, 10) = 40.09, p < 0.001$ was demonstrated by means of simple effects analysis to be the result of a sharp pre/post increase in validity of cognition level as a result of delayed treatment ($p < 0.001$), but no pre-post difference

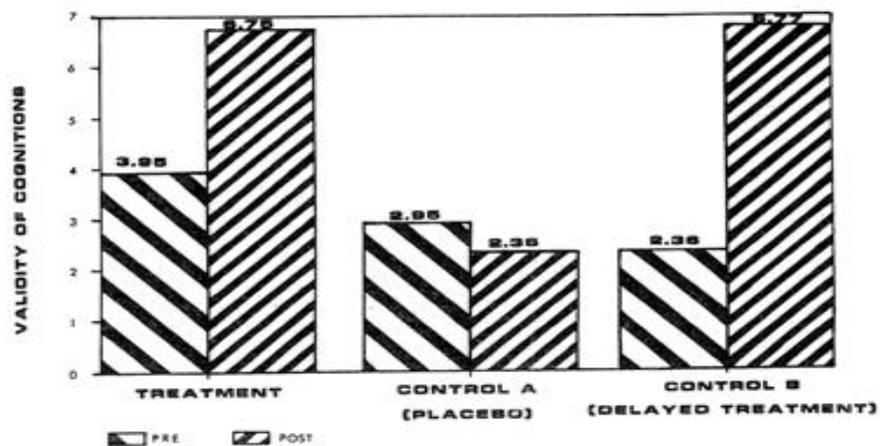


Fig. 3. Mean validity of cognitions for Treatment, Control A (placebo) and Control B (delayed treatment) groups in Session 1.

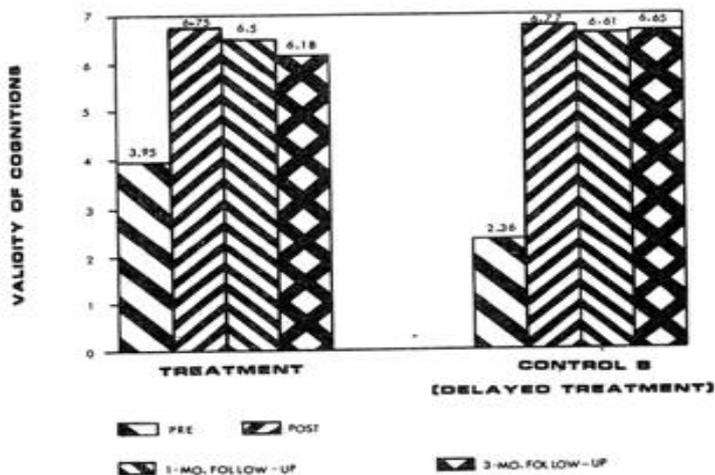


Fig. 4. Mean validity of cognition for Treatment and Control B (delayed treatment) groups in Session 1, and 1-month and 3-month follow-up.

for the placebo condition. Figure 4 presents the mean validity of cognition values for the Treatment and Control (delayed treatment) Groups for Session 1 and 1- and 3-month Follow-Up Sessions. These data were subjected to a 2 x 4 analysis of variance. Both the effect factor of Session 1 Pre/Session 1 Post/1-Month Follow-Up/3-Month Follow-Up, $F(3, 51) = 79.88$, $p < 0.001$, and the interaction, $F(3, 51) = 6.22$, $p = 0.001$, were statistically significant. Simple effects analyses revealed that the difference between pretreatment and the remaining three conditions was statistically significant ($p < 0.001$) for both Treatment and Control (delayed treatment) Groups. Thus, the increases for both groups were substantial and the high degree of validity of cognition produced by the therapeutic procedure was maintained for both groups through the 3-Month Follow-Up Session. As previous analyses have indicated, there was also an unexpected and unexplained difference between the two groups in the pretreatment condition, which led to the interaction.

Pulse Rate

As noted earlier, pulse rate was obtained as a means of monitoring any severe emotional distress that might be experienced by the subjects, perhaps requiring termination of the session. Fortunately, such an extreme reaction never occurred. It was realized subsequent to the experiment that this measure might represent an index of the effectiveness of the therapeutic treatment. The highest pulse rate occurring during the subjects' first elicitation of the memory was noted for each of the three sessions. A mean decrease of 13 pulses/min was obtained for both Treatment and Control (delayed treatment) Groups between Session 1 and the 1-Month Follow-Up Session, a drop that was maintained at the 3-Month Follow-Up Session.

Unfortunately, no pulse rate data were obtained for placebo and delayed treatment conditions of the Control Group at the end of Session 1. Therefore the results are only suggestive because the lack of comparison data at the end of Session 1 makes it impossible to rule out habituation to the experimenter and the environment as the cause for the decline in pulse rate. Nevertheless, it is important to note that the lowered pulse rates during the initial probe measures at the three sessions are congruent with the reduced self-reported SUDs levels and subsequent behavioral changes.

Primary Presenting Problems

The treatment effect in regards to the alleviation of primary presenting symptoms, as reported by the subjects, is presented in Tables I and II.

Table I. Primary Presenting Problems for Individual Subjects in Treatment Group for Session 1 and 1- and 3-Month Follow-up

Subject	Session 1 Primary Problem	Follow-up	
		1-Month	3-Month
1	Flashbacks	Eliminated(a)	E(b)
2	Intrusive thoughts	Decreased	I(c)
3	Nightmares	Eliminated'	E
4	Lack of trust in men	Decreased	I
5	Flashbacks	Eliminated	E
6	Nightmares	Eliminated"	E
7	Daily headaches/panic	Eliminated	E
8	Flashbacks	Eliminated	E
9	Insomnia	Eliminated	E
10	Flashbacks	Eliminated	E
11	Intrusive thought	Decreased	E

(a) 'Only one dream the night of Session 1 which resolved without fear. No nightmares for the remainder of period.

(b) Eliminated.

(c) Improved.

All subjects reported either a decrease or total elimination of the primary presenting problem during the 1-Month Follow-Up Session. At the 3-Month Follow-Up Session subjects reported either a maintenance or improvement of the 1-month condition. All of the related nightmares and flashbacks had been eliminated. Thoughts of the incident had totally disappeared or, in the case

Table H. Primary Presenting Problems for Individual Subjects in Control (Delayed Treatment) Group for Session 1 and 1- and 3-Month Follow-up

Subject	Session 1 Primary Problem	Follow-up	
		1-Month	3-Month
1	Insecurity in groups	Decreased	I(a)
2	Lack of trust in men	Decreased	S(b)
3	Intrusive thoughts	Decreased	S
4	Flashbacks	Eliminated	E(c)
5	Insomnia	Eliminated	E
6	Insomnia	Eliminated	E
7	Nightmares	Unavailable	
8	Lack of trust in men	Decreased	I
9	Flashbacks/panic	Eliminated	E
10	Flashbacks	Eliminated	E
11	Intrusive thoughts	Eliminated	E

(a) I, Improved.

(b) Same as 1-month follow-up.

(c) E, Eliminated.

of three subjects, were extremely rare and without emotional impact. All subjects reported a higher level of self-esteem and over-all functioning and, when previously problematic, an increased intimacy in relationships. Subjects who were in therapy at the time of the EMD treatment maintained contact with their primary therapists, who in all cases, verified that presenting complaints had been eliminated or substantially reduced immediately following the EMD treatment session. In all but four of the remaining cases, subject reports were verified by parent or spouse.

Examples of typical subjects' reports are as follows:

A subject who had reported a life-long history of one or two violent, fearful dreams per week reported that only one violent dream had occurred the night following the treatment. On this occasion, however, he had felt no fear and in the dream had "ritually bowed to his Samurai enemies." They had then "joined forces" and, since that night, he had had no other violent or fearful dreams. He stated that this was the first period of his life that he could remember having no nightmares and feeling consistently "good and confident, without breaks." His wife reported that he no longer slept fitfully, and that he seemed much calmer and relaxed at home since the session.

One Vietnam veteran who had had flashbacks, intrusive thoughts, and nightmares for 21 years regarding a particular incident also reported only one subsequent nightmare. He reported that there was "no power to it" and had arrived at the realization that "the person cutting my throat was me." No other frightful dreams had occurred and only infrequent intrusive thoughts but "none have power anymore." He also reported himself to be calmer on all related issues and memories.

One other Vietnam veteran was treated for three different memories (see "Procedure" section). Panic attacks that had afflicted him daily were reduced to only one during the 1-month period, flashbacks related to planes overhead had been eliminated, and he had been able to gain and maintain an erection for the first time in 3 years. Changes seemed directly attributable to the content of the three memories treated: (1) feeling out of control, (2) a bomb exploding in Vietnam, and (3) a failed sexual encounter.

Other subjects reported changes in a variety of long-standing problems. One subject who had been orally raped as a child, 40 years ago, had flashback feelings of panic and a gagging sensation in her throat several times a week. Since the treatment session, thoughts of the incident caused no upset, and the panic/gagging sensation had been totally eliminated. Another subject reported that daily headaches had ceased following treatment.

One 11-year-old subject who had been molested over a prolonged period had been so traumatized that she was unable to bring up the molestor's face. However, she was nonfunctional in school because her teacher's face would "turn into someone who would hurt" her. The same thing would happen to the faces of people on the street and she would freeze, seeing "some

weird guy who wants to kidnap a kid." She was desensitized by having her picture the molester's shirt and pants and "imagine/pretend seeing his face." There have been no flashbacks since and she has been functioning again at school over the 3-month period. Her mother also reported that for many months the child had been regularly experiencing violent nightmares which caused her either to wake up screaming or to throw herself out of bed. Her mother stated that the nightmares had been totally eliminated after the treatment session.

Patterns

While the following patterns were unexpected by the investigator, they should be carefully reviewed for the purposes of study replication or clinical intervention.

Mismatch

An important pattern that emerged in this experiment was a consistent anxiety desensitization on each trial, except when a mismatch of picture, cognition, or feeling had occurred. Seventy percent of the Treatment Group subjects revealed a consistent decrease from start to finish in SUDs levels from one set to the next as compared to the Control Group which remained the same or increased (except for one placebo effect). At any time that a decrease

failed to occur after two sets the subjects were asked if the picture, words, or feelings had changed. Without exception, one of these factors had shifted, causing a mismatch to occur. For instance, the cognitive component "It was shameful," which went with the feeling of guilt and shame, no longer applied to the feeling of sadness which had replaced it. In this instance the cognition was replaced with the words, "How sad" and the procedure continued to desensitize the trauma.

Likewise, the picture of the traumatic incident may have switched to an earlier incident which required a different set of cognitions. In this case a different, appropriate cognition was applied to the new incident and that traumatic memory was desensitized before returning to the original picture. These observations seem to indicate that associated traumas are also revealed by the process in a "peel back" fashion. Each of the previous traumas must be desensitized in turn before continuing with the original picture. In these cases, the original picture will often generate less anxiety when reactivated after the older trauma has been treated.

Other cases involving a pictorial mismatch occurred when the traumatic picture changed into a less upsetting form. For instance, one subject reported

that the "leering face" she was imagining had changed to a "smiling face." In other instances, the image of the rapist disappeared totally, leaving a neutral environment. In these cases, it seemed appropriate to return to the original picture when possible which continued the desensitization procedure,

Parenthetically, it should be noted that the traumatic picture may change to a more neutral one and that the subject will be unable to retrieve the original image. In this case, it is possible to continue the desensitization, if it has ceased, by changing the cognition to a more appropriate one (i.e., replacing it with the desired cognition). When the original picture or a facsimile can be retrieved, it is preferable to continue desensitization with it in mind rather than the altered version.

Occasionally, a subject may have taken upon him- or herself to switch the auditory component to the desired positively worded statement. If this was done, it appeared that the desensitization automatically stopped, as indicated by the reported SUDs levels. Upon discovering the nature of the mismatch, the investigator had to direct the subject to return to the original statement before proceeding and a decrease in SUDs level immediately followed. As indicated, the lack of desensitization after two sets meant that some form of mismatch had occurred and once the problem was identified and the components realigned, the SUDs level decreased immediately with the next set of eye-movements.

Progressions

Subjects also reported watching the traumatic incident unfold into a subsequent scene or memory. Other subjects reported a progressive difficulty in retrieving the image, fuzziness, lack of clarity, etc. While the subjects remained aware of the actual event and what occurred, the reaction to the event along with pictorial representations was altered.

Another consistent pattern to appear between each set of saccades was that subjects spontaneously generated new insights and perspectives that were part of a logical train of thought involved in a successful and ecological therapeutic assessment of the situation (e.g., changing "I was to blame" to "I was very young" to "I did the best I could" to "It wasn't my fault"). Regardless of the amount of previous psychological exposure, age, or experience, the subjects consistently generated new insights and perspectives that were congruent with the progressive desensitization process.

In addition, the natural progression of emotions from the stage of denial through fear or guilt, through anger to sadness to relief and acceptance was evident in many subjects. Just as the picture often changed after each set of saccades, so too did emotions. In fact, a subject would first evince extreme anger at the memory, and after the next set of saccades would break

into tears. The sorrow would be intense for a period of approximately 1-2 min and then would subside. The next set of saccades would then bring out a sense of relief, etc. One subject whose memory of her molestation had only recently surfaced vividly, forcefully "exploded" into tears and cried for about 1 1/2 min. When asked how she felt, she replied "I feel as though I have just been exorcised."

These observations pointed to a progression, on the kinesthetic level, of the therapeutic process. Each stage of emotions, although lasting only 1-2 min, seems to clear the emotion out of the system while setting the stage for the next emotional state. The stages listed above from denial to acceptance are standard steps of healing for the trauma victim that normally occur over a period of days, months, or years. However, the EMD procedure seems to trigger an abreactive response and "contract" the therapeutic process to a matter of minutes.

DISCUSSION

Efficacy

The evidence clearly indicates that a single session of the EMD procedure is effective in desensitizing memories of traumatic incidents and changing the subjects' cognitive assessments of their individual situations. Furthermore, these effects were maintained for a 3-month period and were accompanied by behavioral shifts which included the alleviation of the subjects' primary presenting complaints.

Additional support for the efficacy of the treatment is found in the within-subject comparison of the Control Group subjects in their placebo and delayed treatment conditions. It should be noted, however, that since all subjects in this group were exposed to the placebo condition before the delayed treatment procedure (i.e., order was not counterbalanced), these results are only suggestive.

Alleviation of presenting complaints occurred for all subjects. Subjects reported that flashbacks and nightmares were eliminated and that intrusive thoughts were either completely absent or much fewer in number. When intrusive thoughts did occur, they were of the memory without anxiety and the pretreatment negative cognition no longer applied.

Not only did all subjects report the elimination or substantial reduction of intrusive thoughts and sleep disturbances, but those with relationship and self-esteem problems experienced a substantial alleviation of symptoms and indicated a more positive quality of life since the initial treatment.

Experimenter Bias and Subject Expectancy

In the present study the experimenter and author were one in the same. Thus it is legitimate to be concerned with the possibility of demand characteristics, unintentional experimenter bias, and subject expectancies as alternate explanations of the results. Several factors mitigate against this possibility. First, many of the subjects entered the present study expressing grave doubts about the likelihood of success, and thus were biased against supporting the experimental hypothesis. During the EMD process, these subjects would frequently express surprise and disbelief, spontaneously making statements such as: "This is too easy"; "This can't be happening"; "I don't believe this." This reaction was also repeated by many subjects with respect to the longevity of treatment effect. No attempt was made by the investigator to assuage their concerns before, during, or after the treatment session.

The use of standardized disclaimers, instructions, and questioning throughout the study should have helped to maintain the same level of expectancy for the two groups. In addition, subjects had been previously in therapy for a mean of 6 years. The lack of treatment effect during that time and the marked changes produced when the EMD procedure was implemented argues against the possibility that expectancy alone was responsible for the present desensitization and behavioral shifts.

An argument against experimenter bias as the cause of the present results was the sheer magnitude of the effects. It is very unlikely that subtle, unintentional cues from the experimenter could account for the substantial pre-post shifts in SUDs and the validity of cognition levels observed in Session 1 or that these effects as well as the concomitant behavioral shifts (e.g., total cessation of flashbacks and nightmares) would be maintained for 3 months. Independent evaluations by primary therapists, spouses, and parents verified the subjects' reports and indicated that behavioral changes were substantial and stable.

Still, another indication that a specific treatment effect, independent of demand characteristics, occurred was the consistent pattern of desensitization processing for the subjects. No prior description or rationale for the success of either the treatment or the control procedure was given. However, except for three subjects (one Treatment and two Control) who took two trials to begin desensitization, all subjects began to show effects after one trial of the EMD procedure. For the Control Group, delayed treatment began to desensitize the memory as soon as the procedure began, regardless of the amount of anxiety generated during the placebo condition. Further, since all subjects were told that much of what was being done was a physiology check and change was not consistently expected (i.e., consistency was

counter-demanded) this pattern indicates that the procedure rather than expectancy or placebo was the salient factor.

In addition, the mismatch phases (see "Results") were the only instances that deterred the treatment effect, and immediate desensitization resumed when the mismatch was addressed. As previously noted, this pattern, and the finding that subjects tended to switch to an earlier related trauma in way of a "peel-back" pattern, were not anticipated by the investigator. This fact, and the patterned consistency of subjects' desensitization responses, indicates that the EMD procedure is not confounded by extraneous variables and represents a standardized procedure with a predictable effect. In addition, both findings seem congruent with Lang's (1977, 1979) bioinformational theory of emotional imagery by indicating a propositional network of memory/imagery cues and a concurrence of stimulus, response, and interpretive (e.g., cognitive assessment) information which need to be aligned for optimal desensitization.

Ecological Validity of Subject Response

Only two subjects showed a sharp (i.e., more than "2") rise in SUDs level at the Follow-Up Sessions. One subject had experienced a placebo effect in the placebo condition and thus in this instance the EMD procedure was inaugurated with an artificially low SUDs level. The only other subject who revealed a sharp increase in SUDs level (i.e., "0" at the end of Session 1 and "4" at the 1-Month Follow-Up Session) seemed to do so because of pertinent environmental factors. This subject's results were confounded by the fact that she was informed that the man who had raped her was still residing in the area, and was concerned that he would rape her again as he had threatened. At the follow-up, she described her feelings as "two-thirds" better than before. She reported that when she heard about him through mutual acquaintances, she felt more detached and more in control and considered her present emotions (i.e., SUDs rating of "4" rather than the pretreatment rating of "8") to be "very realistic" under the circumstances. The treatment effect was also evidenced by the fact that her main presenting problem of intrusive thoughts had been totally eliminated.

The results of the preceding case indicate that certain fears voiced by the therapeutic community (Fairbank and Brown, 1987; Kilpatrick and Best, 1984; Kilpatrick *et al.*, 1982) regarding the possible problems with flooding and/or SD with respect to the desensitization of *ecologically valid* fears does not apply to the EMD process. In other subjects who showed a SUDs level higher than "0" at Follow-Up Sessions, the emotion was often indignation or anger at the person who had violated them, rather than feelings of anxiety or guilt. Therefore, the small rise in SUDs level indicated by the data

appeared to be primarily based on a new assessment of the situation that was congruent with the validity of the positive cognition they had adapted, and which was maintained during the 3-month period.

Generalization

Subjects reported that memories that were related to the traumatic incident treated in the first session were also generally desensitized. Thus, other incidents of molestations by the same individual, or incidents with a sufficient number of similar cues and associations, no longer caused anxiety. This finding is congruent with the reports of Fairbank and Keane (1982) regarding the effects of flooding in the treatment of PTSD-related memories and with the generalization of extinction effects (Levis and Boyd, 1979). Specifically, it was discovered at the 3-Month Follow-Up Session that all related memories evoked exactly the same response as the treated memory with respect to the kinds of emotions and levels of intensity as the treated memory. This makes the EMD treatment extremely efficacious as a single-session treatment for multiple rapes, molestations, and similar combat experiences.

Underlying Mechanisms

While the present investigation was not designed to explain how EMD works, some conjectures may be made. Other behavioral treatments of traumatic memories (e.g., SD and flooding) have included exposure to memory, relaxation, and manipulation or interruption of vivid imagery. Since EMD has been successful in directly addressing highly traumatic memories in one session, without relaxation (i.e., in many clinical instances without even the deep breath), and without, in some cases, a vivid picture of the event, some other factor must be essential. Furthermore, since in both SD and EMD the client is asked to picture the disturbing event for 6-10 sec and then to discontinue the image, some factor other than this interruptive procedure causes the immediate desensitization of high SUDs level trauma since SD is not effective for trauma desensitization without a hierarchical approach (Wolpe, 1954, 1982).

Exposure to the memory alone does not appear to be the crucial factor in the effectiveness of the EMD procedure since, in the case of flooding, imaginal, and *in vivo* exposure procedures, the traumatic fear stimuli initially cause a rise in anxiety which does not begin to decrease in less than approximately 25 min of continuous exposure (Chaplin and Levine, 1981; Foa and Kozak, 1986). This is congruent with the experience of the placebo condition in which SUDs level increased during the approximately 8 min of

exposure to the memory. However, unlike any other reports of the direct desensitization of high level traumas, the EMD treatment and delayed-treatment condition produced a decrease of 1-5 SUDs units within the first 3 min of treatment and a complete desensitization in 10-40 min. The only subject to exceed a 50-min session was the veteran (described in "Results") who was treated for three traumatic memories in 90 min.

It would therefore appear, congruent with the author's personal experience, that the crucial component of the EMD procedure is the repeated eye-movements while the memory is maintained in awareness. If so, it is of interest to speculate how eye-movements might produce these results.

The author believes that one of the most potentially fruitful areas of study involves Pavlov's (1927) theory of psychotherapeutic effect and the basis of neurosis which involves a balance between excitatory and inhibitory processes. As cited by Wolpe (1954), "If at a given locus of the cortex excitation and inhibition come into conflict with each other at high intensity, the neural elements concerned may be unable to bear the strain and so undergo a pathological change by which the balance is overthrown; and then the animal presents neurotic symptoms. In accordance with this hypothesis, the essence of therapy would be to restore the balance. . ." (p. 220).

Within the present paradigm, the concept of information processing of the trauma "frozen state" should be examined. It may be suggested that pathological neural changes caused by a traumatic overload (as claimed by Pavlov, 1927) "freeze"/maintain the incident in its original anxiety-producing form (complete with representational picture and cognitions of negative assessment). This pathological change of neural elements blocks the usual progression of continued information processing to a resolution. Thus the incident is maintained in active memory and triggered as intrusive thoughts, flashbacks, and nightmares (Horowitz and Becker, 1972). Rhythmic, bilateral saccadic movement along with an alignment of cognition and pictorial image which connects to the physiologically stored traumatic memory may (1) restore the balance, (2) reverse the neural pathology, and (3) allow the information processing to proceed to resolution with a consequent cessation of intrusive symptomatology.

Specifically, this theory assumes that the effect of the traumatic incident is excitatory in nature and causes the imbalance of neural elements. The rhythmic multi-saccadic movement may be the body's automatic inhibitory (or excitation releasing) mechanism, just as unconscious material surfaces and may be partially desensitized during the dream (REM) state of sleep. The EMD process, therefore, reciprocally inhibits the excitatory phase (which is correlated with symptoms of anxiety) and may be strong enough to return balance to the neural elements. This return of functional information processing would manifest itself as a desensitization of the traumatic memory and a concomitant decline in the symptomatically high SUDs level. As the balance

is gradually restored, the pictorial, cognitive, and kinesthetic information is processed and their representations, as reported by the subjects, are progressively altered and resolved causing a cessation of symptomatology.

This hypothesis is also supported by additional information in neurobiology regarding the effects on memory of the alteration of synaptic potential due to repetitive low-voltage current (Barrionuevo *et al.*, 1980). It is possible that the repetitive multi-saccadic movement of the EMD procedure duplicates these results through the neuronal bursts which typify saccadic movement, as suggested by numerous studies of saccades (e.g., Monte and Sender, 1976; Leigh and Zee, 1983; Gale and Johnson, 1984). Both experimental and clinical observations, therefore, indicate that this hypothesis deserves further investigation.

FINAL REMARKS

Since the present study represents the seminal work on the EMD technique, as much information as possible has been included regarding the procedure for purposes of study replication and further investigation. However, it should be emphasized that more detailed explanations may be necessary in order for other experimenters/therapists to achieve the 100% success-rate revealed in this study. Every attempt has been made to standardize the procedure, but there are points in the process where the experimenter must make a decision to take a new tack (e.g., back-track to the original picture, attend to an alternative cognition, pursue a newly revealed memory). However, the specific components of EMD (i.e., eye movements, picture/cognition, "blinking out," and deep breath are a constant in all instances. Therefore, the author is convinced that enough information has been given here to achieve complete desensitization of 75-80% of any individually treated trauma-related memory in a single 50-min session.'

In addition, it must be emphasized that the EMD procedure, as presented here, serves to desensitize the anxiety related to traumatic memories, not to eliminate all PTSD-related symptomatology and complications, nor to provide coping strategies for the victims. It has been necessary for the author to work with some clients (Vietnam veterans, rape/molestation victims, and ritual abuse victims from age 5 to 74) for a number of sessions before the wide range of problems for a given individual were resolved. The results have been profoundly successful, with an average treatment time of five sessions, as well as modified EMD instructions to the client for personal use. However, it seems to the author that supplemental training for clinicians in the EMD procedure will be necessary for full therapeutic success.

'Readers interested in a full description of the procedure should write to the author.'

So far four therapists have been trained by the author in the EMD procedure, and all are achieving excellent results with trauma victims during one-session desensitizations and multisession clinical interventions. The fact that other therapists have successfully used EMD strengthens the contention that it is a standardized treatment procedure, not requiring special and perhaps unspecifiable personal characteristics of the present investigator.

In conclusion, these findings open many research possibilities regarding the neurobiological basis of saccades and their connection to memory, information processing, and desensitization effect in the treatment of stress-related symptomatology. Further, the information processing patterns revealed by the subjects open some interesting avenues in regard to the memory network itself. Studies are presently underway to investigate the various components of EMD and a variety of possible treatment effects.

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