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Post Traumatic Stress Disorder and Behavioral Therapy Intervention Techniques Used in Treatment

Travma Sonrası Stres Bozukluğu ve Tedavisinde Kullanılan Davranışçı Terapi Müdahale Teknikleri

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ABSTRACT

Post-traumatic stress disorder (PTSD) is a disorder that significantly reduces the functionality of people with symptoms of this disorder and negatively affects their psychological health. Behavioral therapy is an empirically based therapy approach used in the treatment of this psychological disorder and many other psychological disorders. In this study, the articles on behavioral therapy intervention techniques used in the treatment of PTSD and the empirical basis of these techniques were compiled. The literature review in Turkish and English revealed that psychoeducation, real-life exposure, imaginary exposure, prolonged exposure, breathing exercises, relaxation training and systematic desensitization behavioral therapy intervention techniques are commonly used in the treatment of PTSD and that these techniques are effective in the treatment of the disorder.

Key words: Post-traumatic stress disorder, behavioral therapy, exposure, systematic desensitization, breathing exercise, relaxation training, psychoeducation

ÖZ

Travma sonrası stres bozukluğu (TSSB), bu bozukluğun belirtilerini gösteren kişilerin işlevselliklerini önemli ölçüde azaltan, psikolojik sağlıklarını olumsuz etkileyen bir bozukluktur. Davranışçı terapi ise bu psikolojik bozuklukla birlikte diğer pek çok psikolojik bozukluğun tedavisinde kullanılan görgül temellere dayanan bir terapi yaklaşımıdır. Bu çalışmada yapılan alanyazın taraması sonucunda ulaşılan ve TSSB tedavisinde kullanılan davranışçı terapi müdahale tekniklerini ve bu tekniklerin görgül temellerini konu alan makaleler derlenmiştir. Türkçe ve İngilizce alanyazındaki çalışmalar incelendiğinde, TSSB tedavisinde yaygın olarak psikoeğitim, gerçek hayatta maruz bırakma, hayali maruz bırakma, uzun süreli maruz bırakma, nefes egzersizleri, gevşeme eğitimi ve sistematik duyarsızlaştırma davranışçı terapi müdahale tekniklerinin kullanıldığı ve bu tekniklerin ilgili bozukluğun tedavisinde etkili olduğu sonucuna ulaşılmıştır.

Anahtar sözcükler: Travma sonrası stres bozukluğu, davranışçı terapi, maruz bırakma, sistematik duyarsızlaştırma, nefes egzersizi, gevşeme eğitimi, psikoeğitim

Introduction

Post-traumatic stress disorder (PTSD) is a psychological disorder which can occur after an unusual traumatic event as a source of severe stress and is characterized by symptoms such as involuntary repetitive memories of this traumatic event, slowed reaction, decreased participation and interest in activities, and persistent negative mood (APA 2013). Unusual traumatic life events such as natural disasters, accidents, wars, and abuses are those that might exceed one's personal resources for coping. To protect the psychological health of people who have been exposed to or witnessed such life events and the unique nature of the problems experienced by these people have led to the need to diagnose and treatment of PTSD (Çolak et al. 2010). Although attempts to meet this need have continued since DSM-I, the concept of "Post-Traumatic Stress Disorder" was first included in the DSM-III under the section of "Anxiety Disorders" (APA 1980). With developments in the attempt to classify diagnoses, PTSD was removed from the section of "Anxiety Disorders" in the DSM-5 and is re-classified under a separate section called "Trauma and

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Stressor-Related Disorders" (Özten and Sayar, 2015). In this study, we aimed to review the epidemiology and etiology of PTSD as well as behavioral therapy intervention techniques, which are frequently used in its treatment, in light of literature findings published between 1967-2020.

Epidemiology of PTSD: The World and Turkey

Attempts for diagnosis and classification have brought along developments in understanding the psychological problems experienced by people who have been exposed to or witnessed traumatic life events and to get to know these people better. Although traumatic life events are defined as unusual, it is thought that 80-100% of people have experienced at least one traumatic life event (Breslau et al. 1997). Despite this very high rate, the lifetime prevalence rate of PTSD is 1.35% (Mcfarlane 1997).

There are limited studies on the epidemiology of PTSD in Turkey and most of the available studies have focused on individuals who have experienced an traumatic earthquake. For example, in a study conducted with 1000 individuals who had experienced the 1999 Marmara earthquake, the prevalence rate of PTSD was found to be 43% eight months after the earthquake (Başoğlu et al., 2002). In another study conducted with 910 individuals who also had survived the 1999 earthquake, 42 months after the event the prevalence rate of PTSD was found to be 25% (Tural et al. 2004). In addition to the variation in prevalence rates of PTSD in different populations, there are also gender differences in the risk of developing this disorder. While the risk of developing PTSD is 10.4-19% for women, this rate is 5-10% in men (Breslau et al., 1991). This difference is due to the fact that life events that pose a risk of trauma differ in terms of genders. For example, while the rate of PTSD is 48.4% in raped women, this rate is 10.4% in seriously injured men (Kessler et al., 1995). Therefore, the differentiation of life events between the sexes, such as women being exposed to rape experiences more than men, creates a difference between the sexes in terms of the risk of developing PTSD.

Another factor that determines the risk of developing PTSD, such as the gender differences in life events, is whether the traumatic life event is caused by natural causes or not. Studies show that traumatic experiences (rape, etc.) caused by other people increase the risk of developing PTSD more than traumatic experiences (natural disasters, etc.) caused by natural causes (Breslau et al., 1991, Oflaz et al., 2010). Low socioeconomic status, being single or widowed, childhood sexual abuse experiences, family history of psychiatric disorders, and introversion are other factors that increase the risk of developing PTSD (Geyran, 2000). For example, in a study conducted with 49 Syrian refugees who had to migrate to Turkey due to war, it was reported that as the number of traumatic events increased the PTSD scores increased. Further, there was a negative relationship between the number of children one had and PTSD scores, and being single was associated with an increase in PTSD and depression scores (Özen and Cerit, 2018).

Etiology of PTSD

When the causes of PTSD are examined from the perspective of the biopsychosocial approach, which emphasizes the examination of the biological, psychological and social causes of diseases, it is seen that PTSD is affected by many factors. These causal factors can simply be grouped under the headings of biological, psychological, and social factors.

1. Biological Factors

The focus of many studies examining the biological factors associated with PTSD has been the level of *cortisol*, which plays a role in the body's stress response. For example, in a controlled study conducted with a sample of 55 people, it is stated that while the cortisol levels of people exposed to a traumatic life event increase in the acute period, this increase decreases over time. (Nemeroff et al. 1988). Parallel to this finding, in another study conducted on animals, it was reported that the glucocorticoid level in animals decreased in chronic stress and increased in acute stress (Yehuda et al. 1991). In studies examining the effects of stress on the brain, it has been reported that acute stress causes a decrease in the sensitivity of the $\alpha 2$ noradrenaline autoreceptor to noradrenaline neurotransmitter in the amygdala, hypothalamus, locus ceruleus, and hippocampus (Geyran 1995). Further, this decrease in sensitivity causes an increase in noradrenaline in these brain regions (Bolu et al. 2014). The increase in noradrenaline in the neurochemistry of the brain manifests itself as physical symptoms of anxiety such as increase in blood pressure, tremor and tension in the muscles (Bolu et al. 2014). In addition, the known regulatory effect of dopamine in the hippocampus and the prefrontal cortex on working memory, and, the memory-related symptoms of individuals with PTSD suggest that these symptoms are related to dopamine (Geyran 1995).

In a twin study on the genetic background of PTSD, it is reported that the role of genetic factors in this disorder varies between 21% and 37% (Dikkatli 2020). If we evaluate the biological factors of PTSD in terms of gender, according to the study results of Merikangas et al. (2010) consisting of a large sample of 10,123 people, the prevalence among women was 8%. For men this prevalence was 2.3%. In the same study, the prevalence of PTSD in the adolescent age group (13-18 years) was found to be 5%. Similarly, in another meta-analysis study including 68 studies, a higher PTSD diagnosis was found in women than in men (Ozer et al. 2003).

2. Psychological Factors

Freud argues that severe traumatic experiences cause painful psychological symptoms in the person by leaving the person's defense mechanisms inadequate and exceeding the ego's coping capacity (Bolu et al. 2014). The individual exposed to a traumatic life event tends to respond to this event in a similar way to previous stressors. However, this response is not an adequate and appropriate response to combat the traumatic experience and causes confusion in the person's reactions. This situation further

Table 1. The main behavioral interventions used in the treatment of PTSD, the purpose, and application of the interventions

Interventions	Purpose	Application
1) Psychoeducation	Increasing the client's control over PTSD by informing the subject about the psychological effects of PTSD.	Behavioral concepts such as avoidance behavior, conditioned-unconditioned stimulus, exposure, and psychological mechanisms that have a causal role in the development and maintenance of PTSD are explained.
2) Real Life (İn Vivo) Exposure	Exposing the subject in real life to the fearful stimulus and preventing the avoidance behavior to extinguish the classically conditioned fear response.	The case is exposed to the fearful stimulus in real life, accompanied by a therapist, with the goal to prevent the avoidance behavior. Through this exposure, the client gains control over the fear response, which is a conditioned response to the conditioned stimulus.
3) Imaginary (In Vitro) Exposure	In situations where exposure in real life cannot be used or is risky, facilitating the extinction of the fear response by imagining the client's classically conditioned fearful stimulus and preventing the avoidance behavior.	The client is exposed to the fearful stimulus he acquired after classical conditioning in his imagination with the help of imagination methods or virtual reality technologies, such as visualizing the stimulus in the company of a therapist. Through this exposure, the client gains control over the fear response, which is a conditioned response to the conditioned stimulus.
4) Prolonged Exposure	To enable the client to gain control over the psychological effects of the traumatic event through controlled reliving of the traumatic event and reprocessing the cognitive elements of the event.	The client is first imaginatively exposed to the fearful stimulus which were acquired through classical conditioning. The client is exposed to the fearful stimulus in real life after gaining a certain degree of dominance over the fear response through this imaginary exposure. Thus, more dominance is gained over the fear response. However, the client's avoidance of activities he enjoys is also prevented by exposure. Thus, depressive symptoms are also tried to be reduced.
5) Breathing Exercises	To prevent the aggravation of the stress response to the traumatic life event by increasing the amount of oxygen going to the brain as a result of deepening the breathing.	In order to include the diaphragm in breathing, the clieny is told to take a deep breath and then exhale more slowly. By prolonging the exhalation time, the exacerbation of the stress response to the traumatic event is prevented.
6) Relaxation Training	To reduce the increased activation of the sympathetic nervous system triggered after a traumatic life event by triggering the activation of the parasympathetic nervous system.	The client is asked to sit in a comfortable position, and then to tense and slowly relax the leg, hip, arm, shoulder, neck and face muscles, respectively. The patient is made to feel the difference between relaxation and tension. In order to make the patient comfortable, support can be obtained from pleasing visual or auditory stimuli.
7) Systematic Desensitization	Becoming desensitized to the fearful stimulus by gradually exposing the client to the classically conditioned fearful stimulus and preventing the avoidance behavior.	A hierarchy of anxiety from low to high is created for the fearful stimulus together with the client, who was given relaxation training beforehand. Then, the individual is exposed to anxiety-provoking situations in imaginary or real life, following the hierarchical order. The level of anxiety that rises during exposure is reduced by the use of relaxation exercise. Thus, the client is gradually desensitized to all anxiety states related to the traumatic stimulus, from low to high.

increases the existing anxiety level (Bolu et al. 2014). Another factor which determines coping with anxiety brought about by a traumatic life event is *chronological age*. It is known that young and senior adults have more difficulty in dealing with this anxiety than middle-aged individuals (Özgen and Aydın 2016). In young individuals this might be due to the lack of some psychological skills (cognitive skills necessary for coping, etc.) that come with age, while for senior adults this may be due to the fact that the existing anxiety about the end of life exacerbates the anxiety caused by the trauma.

The effect of culture on the individual is yet another factor which plays a role in the development of PTSD after traumatic life events. For example, in a study conducted with Vietnam war veterans, it was reported that the lifetime prevalence of PTSD was higher in soldiers belonging to the minority group (Marsella et al. 1993), and the effects of the war were more pronounced (Marsella and Kameoka 1989). This may be due to the fact that the discrimination faced by minority groups in their culture makes it difficult to cope with the anxiety brought on by traumatic experiences. Along with witnessing a traumatic life event, factors such as the loss of a relative or physical harm as a result of the

Table 2. Summary of case studies on the effectiveness of behavioral ınterventions used in the treatment of PTSD

Study	Measurement	N	Age *M*(*SD*)	Study Aim	Therapy/ Intervention	Control Grup	Type of Therapy/ number of sessions	Inventories*	Results	Değişimin Anlamlılık Düzeyi
Watson et al. (1997)	Pre-test and Post-test	90 (Male = 90)	*M* = 45.6 (*SD* = ?)	Relaxation on PTSD symptoms of Vietnam war veterans; breathing exercise and relaxation; To examine the effect of breathing exercise, relaxation and biofeedback components.	Relaxation exercise group; relaxation and breathing exercise group; relaxation exercise, breathing exercise, biofeedback group	No Control Group	Individual Therapy / 10 Sessions	EMG PTSD-I MSCR-PTSD	Significant improvement in symptoms of intrusive memory, loss of interest, emotional alienation, and emotional blunting.	W.G.: (+) B.G.: (-)
Beck et al. (2007)	Pre-test and Post-test	6	*M* = 49.50 (*SD* = 7.03)	To examine the effect of 10 sessions of virtual reality exposure on PTSD symptoms after a motor vehicle accident.	Exposure through virtual reality to scenarios of the traumatic event.	No Control Group	Individual Therapy / 10 Sessions	CAPS PSS-SR IES-R BAI BDI-II	Significant improvement in re-experiencing, emotional blunting, and avoidance symptoms	W.G.: (+)
Kılıç (2008)	Pre-test and Post-test	114	18-50 age range *M* = ? (*SD* = ?)	To examine the effect of psychoeducational psychosocial support study on depression, anxiety, and PTSD symptoms of Pakistani earthquake survivors.	4 sessions of psychoeducational psychosocial support.	+	Group therapy / 4 Sessions	CPTSDCL MAI BDE-U Self-Esteem Scale	Significant improvement in depression, anxiety, and PTSD symptoms of the study group.	B.G.: (+) W.G.: (+)
Oflaz et al. (2008)	Pre-test and Post-test	51	*M* = 32.70 (*SD* = 12.70)	To examine the effects of psychoeducation, drug therapy, and the combined use of psychoeducation and drug therapy on earthquake survivors' PTSD symptoms.	The group that received only psychoeducation (*n* = 14), the group that received only medication (*n* = 16), and the group that received both (*n* = 21)	No Control Group	Individual Therapy / 6 Sessions	CAPS HDS CSS	Greater improvement in symptoms as a result of the application of psychoeducation in addition to drug therapy.	W.G.: (+)
Yeomans et al. (2010)	Pre-test and Post-test	113	*M* = 38.60 (*SD* = 12.80)	To compare the effect of psychoeducation, non-psychoeducational workshop, and waiting list on PTSD symptoms with victims of armed conflict.	Psychoeducation group (*n* = 38), workshop group not receiving psychoeducation (*n* = 37), waiting list group (*n* = 38)	+	Group therapy/ 3 sessions	HTQ	A more significant improvement in symptoms compared to the waiting list in both groups, but more in the group that did not receive psychoeducation.	W.G.: (+) B.G.: (+)

Table 2. Continued

Study	Measurement	N	Age *M*(*SD*)	Study Aim	Therapy/ Intervention	Control Grup	Type of Therapy/ number of sessions	Inventories*	Results	Değişimin Anlamlılık Düzeyi
Hilton et al. (2011)	Pre-test and Post-test	24	*M* = 27.52 (*SD* = 6.44)	To compare the effects of culturally adapted cognitive behavioral therapy and relaxation exercise in Hispanic patients with treatment-resistant PTSD symptoms.	The group receiving culturally adapted cognitive therapy (*n* = 12), the group receiving relaxation exercise (*n* = 12)	No Control Group	Group Therapy/14 sessions	PTSD-CL SCL-AS ERS NS	A greater improvement in PTSD symptoms in the group receiving culturally adapted cognitive therapy than in the group receiving relaxation exercise	B.G.:(+) W.G.: (+)
Reger et al. (2011)	Pre-test and Post-test	24	*M* = 28.80 (*SD* = 6.7)	To examine the effect of virtual reality exposure on PTSD symptoms of soldiers on active duty in Iraq or Afghanistan.	90 minutes of virtual reality exposure between 3-12 sessions.	No Control Group	Individual Therapy / average of 7 Sessions	PTSDCL-M	Significant improvement in participants' PTSD symptoms after treatment.	W.G.: (+)
Gros et al. (2011)	Pre-test and Post-test	89	*M* = 45.20 (*SD* = 16.0)	Comparing the effectiveness of telehealth (*n* = 62) and face-to-face (*n* = 27) exposure practices on veterans' PTSD symptoms	12 sessions of exposure therapy for both groups	No Control Group	Individual Therapy / 12 Sessions	PTSDCL-M BDI DASS	Significant improvement in PTSD symptoms in both groups, more so in the face-to-face exposure group.	W.G.: (+) B.G.: (A)
Eftekhari et al. (2013)	Pre-test and Post-test	1931	*M* = 46.80 (*SD* = 14.3)	Evaluating the effectiveness of long-term exposure on veterans' PTSD symptoms	Long-term exposure sessions administered individually to 1931 patients by 804 clinicians	No Control Group	Individual Therapy / Average of 9 Sessions	PTSDCL BDI-II	Significant improvement in both PTSD and depression scores of patients as a result of the intervention	W.G.: (+)
Kolit et al. (2019)	Pre-test and Post-test	19	*M* = 38.42 (*SD* = 13.65)	To evaluate the effect of relaxation training in the treatment of pain, fatigue, and sleep problems seen in PTSD patients.	Relaxation training for 5 weeks, 2 days a week	No Control Group	Individual Therapy / 10 Sessions	VAS	Significant improvement after intervention in participants' symptoms of pain, sleep disturbance, and fatigue.	W.G.: (+)

Note. *Electromyography (EMG), Mississippi Scale for War-Related PTSD (MSCR-PTSD), PTSD-I, Civilian PTSD Checklist (CPTSDCL), Manifest Anxiety Inventory (MAI), Beck Depression Inventory-Urdu Form, Self-Esteem Scale, Clinician-Administered PTSD Scale , Post Traumatic Stress Inventory (PSS-Sr), Event Impact Scale (EIS-R), Beck Anxiety Inventory (BAI), Beck Depression Inventory-2 (BDI-II), Hamilton Depression Scale (HDS), Coping Strategies Scale (CSS), PTSD Checklist (PTSD-CL), Symptom Checklist- Anxiety Scale (SCL-AS), Emotion Regulation Scale (ERS), Tension Scale (NS), PTSD Checklist- Military Version (PTSDCL-M) , Depression Anxiety Stress Scale (DASS), PTSD Checklist (PTSDCL), Visual Analogue Scale (VAS), W.G.: Within-groups, B.G.: Between-groups, ?: No information.

event are among the factors affecting the development of PSD. A study examining the development of PTSD after an industrial explosion in Turkey reported that factors such as having any other mental disorder, being familiar with people among the deceased or injured, experiencing physical harm, and seeing bodies of deceased were reported as risk factors for PTSD (Taymur et al. 2014).

If we evaluate the psychological factors of PTSD in terms of trait characteristics, according to the results of a recent meta-analysis which included 40 studies, emotional reactivity and perseveration traits increase PTSD symptoms, while resilience, mobility, and sensory sensitivity and activity traits are related to reduction of PTSD symptoms. All the effects sizes were small and medium-sized (Cyniak-Cieciura and Zawadzki 2021).

When behavioral explanations for the etiology of PTSD are examined, Mowrer's two-factor learning model is most frequently encountered (Yavuz and Kartepe 2015). According to this model, when exposed to a life-threatening event, a conditioning occurs through the stimuli present during the event. These stimuli which create the conditioning can be internal or external stimuli. Following this conditioning, the individual learns to reduce the severity of the stress related to the stimulus by recognizing and avoiding the relevant stimulus after the trauma. This avoidant behavior acts as a negative reinforcement by reducing the stress caused by the stimulus for a short time. This negative reinforcement task is an important factor in maintaining the avoidance response to the stimulus. The fear response caused by the stimulus through classical conditioning results in the retainment of the avoidance behavior through operant conditioning. As a result of generalization of the fear response to stimuli not present during the event (i.e., irrelevant stimuli), the frequency of avoidance behavior also increases and leads to negative effects on the functionality of the individual (Yavuz and Kartepe 2015).

3. Social Factors

The social support which an individual receives from his/her environment is among the social factors which play a role in the development of PTSD. In a controlled study conducted with a sample of 1648 people, it was reported that individuals with risk factors such as numerous traumatic life events, high-level stressful life events, and low social support were 3.26 times more likely to develop PTSD than individuals without these (Lian et al. 2014). The number of traumatic life events that the person is exposed to also plays a decisive role in the development of PTSD. The probability of developing PTSD in individuals exposed to five traumatic life events is five times higher than that of individuals exposed to one traumatic life event (Lian et al. 2014). This may be due to the fact that it is more difficult to cope with the cumulative effect of traumatic life events.

Social support can be a protective factor, not only for people who are directly exposed to the traumatic life event, but also for those who witness the traumatic life event through written and visual media, thus, also against developing secondary trauma (Sungur 1999). In light of these findings, it can be said that individuals who are deprived of social support have a higher risk of developing PTSD than individuals who receive social support after experienced traumatic events or witnessing them. Without doubt, this is an indication of the importance of social structure and its impact on humans as social beings in terms of psychological disorders. Therefore, receiving support from the social structure of the individual is important in terms of reducing the risk of developing PTSD for individuals who have been exposed to or witnessed a traumatic life event. For example, in a study conducted in Turkey examining the relationship between perceived social support scores of cancer patients and PTSD symptoms, it was reported that participants with higher perceived social support scores showed fewer PTSD symptoms (Erdoğan 2015), thus, indicating the importance of perceived social support by individuals with PTSD.

Behavioral Therapy

Behavior therapy, also called behavior modification therapy or cognitive behavioral therapy, is a therapy approach to treat psychological disorders (Spiegler and Guevremont 2010). This therapy approach is a short-term scientific approach that focuses on the present, behavioral actions, and learning. An important factor in the emergence of behavioral therapy was the increasing need for short-term and quick-solving therapy approaches after the Second World War, and the inability of psychoanalysis to meet this need, as well as major developments in learning-oriented studies (Spiegler and Guevremont 2010). This approach, which is based on learning principles such as classical and operant conditioning, aims to teach the client the ability to change problem-oriented behaviors by using various techniques (Spiegler and Guevremont 2010). To achieve this goal, the therapy include techniques such as imaginary (in vitro) exposure, real-life (in vivo) exposure, systematic desensitization, breathing exercises, relaxation training, prolonged exposure, and psychoeducation.

Behavioral Therapy Intervention Techniques Used in the Treatment Of PTSD

1. Psychoeducation

It is an intervention technique with an educational content designed to develop psychological skills in the client or patient (Madrid and Swanson 1995). When this content is designed according to PTSD, the individual is informed about the trauma and its effects on the individual, and how negative reactions to trauma exacerbate the symptoms. Further, it is aimed that the individual who has developed PTSD familiarizes with the idea that reactions developed against the traumatic event are normal, but, non-functional reactions (Sütçigil and Aslan 2012).

2. Real Life (In Vivo) Exposure

Based on Mowrer's 2-factor learning model, this technique aims to prevent the negative emotions created by classical

conditioning from being maintained by operant conditioning (Yavuz and Karatepe 2015). This technique is applied to the traumatic event in particular, by preventing the behavior of avoiding negative emotions created by classical conditioning (this avoidance behavior provides a short-term relief in practice) and by ensuring that the individual is directly exposed to these negative emotions. (Yavuz and Kartepe 2015). Preventing the avoidance behavior helps the individual to develop the ability to cope with the negative emotions created by the trauma. In situations where it is difficult for the individual to visualize the memory of the traumatic event, real-life (in vivo) exposure may be preferred. In addition, imaginary (in vitro) exposure should be preferred in cases where the individual's traumatic memory cannot be reconstructed or the individual experiences severe anxiety symptoms (Sütçigil and Aslan 2012).

3. Imaginary (In Vitro) Exposure

In the real life (in vivo) exposure technique, the individual is exposed to the avoided object, event, or situation directly. On the contrary, in the imaginary exposure technique the individual is asked to visualize the avoided object, event, or situation (Özer and Yöntem 2019). Virtual reality technology are also used in order to help the individual to visualize the traumatic experience (Özer and Yöntem 2019). In the case of PTSD, this technique (i.e., in vitro exposure) is applied by asking the individual to close his eyes and visualize the traumatic event in his mind (Sütçigil and Aslan 2012) or by designing a very similar traumatic event in virtual reality applications, allowing the individual to be exposed to the event (Özer and Yöntem 2019). The effectiveness of this technique increases as the degree of similarity to the real traumatic event increases (Spiegler and Guevremont 2010).

4. Prolonged Exposure

Developed by Edna Foa for the behavioral treatment of PTSD, this approach includes more than one intervention technique (Özdel et al. 2015). The concept of 'emotion processing' developed by Foa and Kozak forms the basis of the intervention (Foa and Kozak 1985, Foa and Kozak 1986). It is emphasized that this concept (i.e., emotion processing) has a function to avoid dangerous stimuli (Sütçigil and Aslan 2012). The functional aspect of avoidance behavior of individuals with PTSD can be explained with this concept. 'Emotion processing' means that each anxiety-based disorder contains a unique pathological fear structure and the symptoms of the disorder can be reduced by emotional reprocessing of this fear structure (Foa and Kozak 1985).

With this technique, it is aimed to relive the cognitive elements related to the traumatic life event in a controlled way, and to gain dominance over these elements by enabling the individual to reprocess these. For this purpose, the individual is first exposed to stimuli related to the traumatic life event imaginary, then, after a certain control over the emotional consequences of these stimuli is achieved, the individual is exposed to the same stimuli in real life. Thus, the deterioration of memory caused by the traumatic life event is brought back to order by reprocessing (Özdel et al. 2015). In addition, the depression triggered by generalization of avoidance behavior and withdrawal from favorite activities is tried to be prevented. This is done by ensuring that the individual participates in activities and is exposed to the fear and anxiety experienced during the activities (Özdel et al. 2015).

5. Breathing Exercises

When exposed to stressful life events, breathing becomes shallow and this reduces the amount of oxygen going to the brain. This in turn causes the reaction to stress to intensify (Turan and Poyraz 2015). During the breathing exercise, the individual takes a deep breath through the nose so that the diaphragm is also included to the breathing action, and then the air is expelled slowly (Turan and Poyraz 2015). Regular and rhythmic breathing exercise can reduce the stress caused by stressful life events (Turan and Poyraz 2015). In the case of PTSD, the primary goal of this technique is to reduce the anxiety caused by the traumatic life event by prolonging the air exit time as much as possible (Sütçigil and Aslan 2012).

6. Relaxation Training

This technique, first developed by Edmund Jacobson, involves sequential stretching and relaxation of large muscle groups (Jacobson 1987). Relaxation training is a therapeutic technique which is widely used with psychological disorders , especially ones containing anxiety-related symptoms, and is applied in group- or individual therapy settings (Demiralp and Oflaz 2007). Its main purpose is to reduce the tension in the muscles as a result of the increased activation of the sympathetic nervous system, by increasing the activity of the parasympathetic nervous system, and to reduce the level of anxiety felt by the individual (Demiralp and Oflaz 2007).

Although there are different application styles of the technique, the first phase is to ensure that the individual sits down in a comfortable position. Presenting pleasing auditory or visual stimuli to the individual are factors that facilitate the relaxation of the individual. After the individual is relaxed, they are instructed to take a deep breath and then slowly exhale. This practice is followed by stretching and relaxing the leg, hip, arm, shoulder, neck and face muscles, respectively (Çenesiz 2015). During this time, the practitioner makes remarks that point out to the difference between the relaxed state of the muscle groups and the tense state, thus reducing the cognitive, physical, and behavioral symptoms caused by anxiety (Demiralp and Oflaz 2007). In a study conducted with 19 participants with mental health problems, it was reported that relaxation training caused an improvement in the treatment of pain, fatigue, and sleep problem symptoms, which are also seen in PTSD (Kolit et al. 2019). In addition, there are findings showing that relaxation training has also positive effects on anger symptoms of individuals who experience anxiety (Cragan and Deffenbacher 1984). Finally, in another controlled study conducted with a sample of 48 people, it was revealed that an intervention program including relaxation training resulted in improvement of adolescents' stress symptoms (Kiselica et al.

1994).

7. Systematic Desensitization

This technique, first developed by Wolpe (1961), aims to systematically, step by step, desensitize the individual to the anxiety-provoking situation. For this purpose, the individual is first taught relaxation techniques to be used in the desensitization process. Then, the situations which the individual worries about are hierarchically ordered from low-level anxiety situations to high-level anxiety situations. The individual is exposed to these hierarchically ordered anxiety-provoking situations, imaginary or in real life, by following the hierarchical order. Since the individual is gradually exposed to the fearful stimulus, he gains step-by-step control over the emotional response created by the stimulus (Wolpe 1961). At this stage, the relaxation techniques taught to the individual beforehand reduces the anxiety caused by exposure to the anxious situation (Demiralp and Oflaz 2007). This helps the individual to realize the change in his physiological activity and develop a sense of control over his body (Çenesiz 2015). The use of this intervention technique for PTSD reduces the individual's anxiety and avoidance behavior triggered by reminders (e.g., stimuli) of the traumatic event.

Effectiveness of Behavioral Interventions

In a comparison study on the effectiveness of the 12-session exposure technique applied face-to-face or via telehealth in order to improve the PTSD symptoms of war veterans (N = 89), it was reported that the exposure technique caused significant improvements in both application forms, but it was concluded that the face-to-face application resulted in a greater improvement (Gros et al. 2011). In another study conducted with war veterans (N = 1931), it was found that the symptoms of veterans screened with the PTSD Checklist decreased from 87.6% to 46.2% after individual therapy, which included a long-term exposure technique. The effect size of the treatment was reported as d = 0.87. In addition, the long-term exposure therapy resulted in a significant improvement in patients' depression symptoms assessed by the Beck Depression Inventory. The effect size of this treatment on depression symptoms was reported as d = 0.66 (Eftekhari et al. 2013).

In another study conducted with 24 US soldiers actively serving in Iraq and Afghanistan, it was reported that the intervention involving exposure technique in a virtual reality environment resulted in a significant reduction in the PTSD symptoms of soldiers (Reger et al. 2011). In parallel with this finding, it was shown that 10-session virtual reality exposure technique applied to 6 people who had a traffic accident and showed symptoms of PTSD resulted in a significant improvement in the participants' emotional blunting, re-experiencing, and avoidance behavior symptoms (Beck et al. 2007). This finding confirms that exposure with virtual reality is an alternative and effective intervention in conditions where exposure technique cannot be applied because some clients with PTSD symptoms cannot visualize the traumatic experience or it is difficult to create situations similar to some traumatic experiences. Also, the findings of this study are important in that it contains a different sample from the military/veteran/war victim samples commonly included in studies on PTSD in the literature, and that the treatment is found to be effective in this different sample.

Studies have been reporting on the effectiveness of interventions containing psychoeducation in the treatment of PTSD. For example, a study conducted with 51 survivors of the 1999 Marmara earthquake reported that the application of psychoeducational interventions to cope with trauma stress, alongside drug therapy, resulted in a greater reduction in PTSD stress and a significant improvement in depressive symptoms caused by PTSD. The same study found that there was no significant difference between the group using only medication and the group receiving only psychoeducation (Oflaz et al. 2008). This finding indicates that if drug therapy is added to psychoeducational interventions, a higher rate of improvement will be achieved. In another controlled study (3X2 factorial design) conducted with 113 victims of armed conflict, it was reported that the workshop group without psychoeducation and the psychoeducation group achieved a greater and significant improvement in PTSD symptoms compared to the waiting list group. Moreover, the group that experienced the greatest improvement in PTSD symptoms was the workshop group that did not receive psychoeducation. This finding may be due to the fact that, unlike the group with psychoeducation, the workshop group had the opportunity to share their experience more and answered additional questions (Yeomans et al. 2010). In a controlled study conducted with 114 people after the 2005 Pakistan earthquake with the contributions of the Turkish Red Crescent, it was reported that 4-session psychosocial intervention with psychoeducation resulted in a significant reduction in anxiety, depression, and PTSD symptoms of earthquake victims compared to the control group (earthquake victims who did not receive psychosocial support; Kılıç, 2008).

Studies have established empirical evidence on the effectiveness of relaxation training interventions on the treatment of PTSD. For example, in a study conducted on 24 treatment-resistant Latino women with PTSD symptoms, it was reported that the intervention including relaxation training had a significant effect on recovery with an effect size of d = 0.80. However, in the same study, it was reported that the group which received culturally adapted cognitive behavioral therapy (CBT) as a comparison group showed more improvement in PTSD symptoms than the group which received relaxation exercises (Hinton et al. 2011). This difference may be due to the fact that the content of culturally adapted CBT is richer than the content of relaxation training. In addition, co-administration of culturally adapted CBT with relaxation training may result in higher recovery rates. In another relaxation exercise study conducted with 90 Vietnam veterans, the participants were divided into 3 groups; the group that received relaxation exercise only, the group that received breathing exercise together with relaxation exercise, and the group that received relaxation exercise and biofeedback together with breathing exercise. Following, the groups were

applied interventions for 10 sessions and measurements were taken with EMG and PTSD-I before and after the treatment. Findings showed that the practice of relaxation exercise results in a significant therapeutic improvement in symptoms of intrusive recollection, loss of interest, emotional alienation, and emotional blunting. However, it was reported in the study that the inclusion of breathing exercises and biofeedback practices together with relaxation exercise did not create a significantly better therapeutic effect compared to relaxation exercise alone (Watson et al. 1997). In the literature, it is seen that different behavioral techniques are used in different types of trauma. For instance, Oflaz et al. (2008) used psychoeducation in their study with individuals exposed to earthquake trauma, and Watson et al. (1997) used relaxation and breathing exercise techniques for war veterans. In the study conducted by Beck et al. (2007), it is seen that virtual reality exposure technique is used for individuals who have had a motor vehicle accident. From this point of view, considering the nature of the traumatic life event and the individual differences of the individuals exposed to the event, it can be said that behavioral intervention techniques to be used in the treatment of PTSD should be adapted according to individual characteristics.

Conclusion

Considering the above-mentioned findings of domestic and international studies examining the therapeutic effect of behavioral therapy intervention techniques on the symptoms of PTSD, it can be said that there are repeated findings that these intervention techniques have a significant therapeutic effect. Although the majority of the studies on the subject have been conducted on samples formed by soldiers and veterans, studies show that therapeutic results are obtained with all behavioral techniques used in trauma sampling. The fact that behavioral intervention techniques can be modified for individual-specific needs allows the use of the same techniques in the treatment of individuals with different behavioral symptoms. Considering the uncertain and unexpected nature of traumatic life events, these supportive findings on the effectiveness of behavioral therapy intervention techniques in restoring the psychological health of people affected by traumatic events are more important than ever. In addition to anxiety, emotional bluntness, re-experiencing, avoidance behavior, etc., which negatively affect the functionality of people with PTSD, treatment of comorbid diagnoses such as depression with behavioral therapy intervention techniques will increase the functionality of these people in their lives. Considering these positive effect, behavioral therapy can be regarded as the initiator of a cumulative chain of effects that are interrelated. Behavioral therapy continues to exist as a therapy approach that maintains its importance for years now, both in clinical practice and research, because it is supported by empirical findings.

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