

ORIGINAL RESEARCH

Effectiveness of internet-based trauma-focused cognitive behavioral therapy (I-TF-CBT) on reducing the symptom severity of post-traumatic stress disorder (PTSD), depression, anxiety, and positive and negative affect in patients with PTSD: A quasi-experimental study

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Abstract

Background: Considering the high prevalence of Post-traumatic Stress Disorder (PTSD) and its comorbid mental disorders, and considering the vast number of patients diagnosed with mental disorders who remain without suitable mental health treatment, employing online methods of delivering mental health therapies seems to be mandatory.

Objectives: The present research aimed to investigate the effectiveness of Internet-based Trauma-Focused Cognitive Behavioral Therapy (I-TF-CBT) on reducing the symptom severity of PTSD and other comorbid mental disorders, such as depression, anxiety, and positive and negative affect among patients diagnosed with PTSD. **Materials and Methods:** The study design was quasi-experimental. Of the 450 individuals who completed the PTSD checklist for DSM-5 (PCL-5), 83 were selected via purposive sampling and interviewed using the SCID-5 clinical interview. Finally, 24 participants were eligible to receive I-TF-CBT. Participants completed a battery of questionnaires, namely Beck Depression Inventory (BDI-II), Beck Anxiety Inventory (BAI), and Positive and Negative Affect Scale (PANAS), online and in three time periods i.e., before, after, and one month after receiving I-TF-CBT. Finally, after the removal of a number of participants, the collected data from 19 participants was analyzed in SPSS-26, using repeated measures ANOVA statistical analysis method.

Results: The findings revealed that I-TF-CBT was effective in reducing the symptom severity of PTSD, depression, anxiety, and negative among patients with PTSD. However, this effectiveness was not significant with regard to positive affect.

Conclusion: This was the first study that investigated the effectiveness of I-TF-CBT on various variables among those diagnosed with PTSD in Iran. The findings revealed that I-TF-CBT was effective with regard to many variables among this population. Nevertheless, more research is needed in order to reach a better conclusion about the effectiveness of this treatment on different variables, especially positive and negative affect.

Keywords: Stress disorders; Post-Traumatic; Cognitive behavioral therapy; Depression, Anxiety; Affect

Introduction

More than 70 percent of the worldwide population have experienced at least one traumatic event in their lifetime (1). This percentage is even higher in some countries, such as Iran (i.e., 89.2%) (2). Traumatic experiences have been linked to many adverse consequences in trauma survivors' lives (3), namely a psychiatric disorder known as Post-traumatic Stress Disorder (PTSD) (4).

PTSD is a disabling psychiatric disorder, which was first introduced in 1980 (5). Some of the common symptoms of PTSD involve intrusion, avoidance, negative changes in mood and cognition, and noticeable alterations in reactivity and arousal, all of which are associated with the trauma experienced by the individual (6). PTSD leads to many adverse consequences in the patients' lives, some of which include dysfunction in different aspects of everyday life, and lessened quality of life (3).

Apart from that, PTSD symptoms seem to affect the patient in many psychological and physiological dimensions. As an example, these patients experience lower levels of positive affect (which reflects emotions such as loving feelings, feeling of being satisfied and happiness) and higher levels of negative affect (such as the feeling of anger, disgust, sadness, and fear) (7). Previous research suggests that negative affect can single-handedly have a significant impact on the comorbidity of other psychiatric disorders with PTSD, namely Major Depressive Disorder (MDD) and Generalized Anxiety Disorder (GAD) (8). Also, past studies report that when PTSD is accompanied by depression, patients suffer from more physical and psychological burden, lesser quality of life, greater risk of suicide, and cardiovascular diseases (9, 10).

In addition to that, the world has been exposed to the Covid-19 pandemic for the past two years, with unpredictable trends, high

mortality rates, and the resulting constraints, including social distancing and limited social support. Preliminary findings show that this pandemic has had significant negative effects on the mental health of the society and has exacerbated the problems of people with mental disorders (11). Therefore, it can be said that there are limitations to receiving appropriate treatment for psychiatric disorders such as PTSD, which are intensified by the prevalence of the Covid-19 pandemic. As a result, implementing effective and appropriate online treatment plans for PTSD can be a positive step to reduce the high burden of psychiatric disorders in the world.

One of the comorbid disorders that usually occurs with PTSD is MDD. This disorder is among the common mental disorders that affects and limits one's social and psychological function, and diminishes their quality of life (12). According to the World Health Organization (WHO), MDD is the third in disease burden in the world (13). Some of the symptoms of depression include noticeable lack of interest in activities, depressed mood, marked weight loss, loss of energy, lessened ability to concentrate, and thoughts associated with death (6). Depression is among the comorbid disorders with PTSD that could lead to more adverse consequences in patients diagnosed with PTSD (14).

Another group of disorders that are reported to be a comorbidity with PTSD are anxiety disorders. These disorders are common worldwide, and are among the main factors associated with the disease burden in the world. Some of the symptoms of anxiety disorders involve restlessness, irritability, muscle tension, hardship in concentration, and disturbance in sleep (6). Although treating these disorders seem to reduce a significant amount of cost in the world, still to this day many patients with these disorders remain untreated (15). Anxiety disorders are among the common comorbidities with regard to

PTSD (16). Previous studies have revealed that the comorbidity of anxiety disorders with PTSD could lead to more symptom manifestations in the patients diagnosed with PTSD (17). This underscores the importance of early diagnosis and treatment of PTSD and its comorbid disorders.

One of the current first line treatments for PTSD is Trauma-Focused Cognitive Behavioral Therapy (TF-CBT) (18). TF-CBT was established by Drs Anthony Mannarino, Judith Cohen, and Esther Deblinger in 2006, with a focus on the use of cognitive and behavioral principles, as well as coping techniques to prevent and treat PTSD, depression, and behavioral problems (19). Internet-based TF-CBT (I-TF-CBT) has been studied with and without exposure, and the results showed that both treatments were effective in patients with PTSD (20). Therefore, in order to avoid the potential risks that may be associated with an online treatment with exposure elements, including assessing the patient's safety and condition while performing exposure exercises, the present study employed the I-TF-CBT treatment protocol without exposure elements (20, 21).

A number of previous studies, including review studies and meta-analyzes, have confirmed the effectiveness of TF-CBT for PTSD patients in different age groups (22, 23). Numerous studies have supported the effectiveness of TF-CBT in reducing PTSD symptoms in adults (24), as well as children (19, 25). However, there are very limited research available that specifically address this first-line treatment for PTSD online (20, 26). In addition to that, to this date, there are no studies in Iran that have investigated this treatment online for patients with PTSD. Therefore, in an attempt to fill the research gap with regard to internet-based treatments for patients diagnosed with PTSD, the present study intended to take a step forward by

examining the effectiveness of I-TF-CBT among those diagnosed with PTSD.

Materials and Methods

Participants

The research population comprised of all Iranian adults (18 years and above) who have had at least one traumatic experience in accordance with Criteria A of PTSD diagnosis in the Diagnostic and Statistical Manual of Mental Disorders-Fifth Edition (DSM-5) (6). The study sample was recruited from the individuals who had completed the PTSD Checklist for DSM-5 (PCL-5) questionnaire online, and included all individuals who were eligible for PTSD diagnosis and the inclusion criteria of the current study according to the clinical interview.

The participants were only included in the present study if they were 18 years old and above, had a diploma degree and above, had access to telephone and internet connection, obtained a minimum score of 31 in PCL-5, met the criteria for PTSD diagnosis according to the Structured Clinical Interview for DSM-5 (SCID-5), were not in the active phase of bipolar disorder, did not have an organic mental disorder or intellectual disability, did not have a psychotic disorder, did not receive more than one session of psychotherapy related to PTSD, did not have plans to harm self or others, did not have any severe PTSD symptoms, such as symptoms of dissociation. Furthermore, if the participants used any medication prescribed by a specialist, the duration and dosage of the medication should not have been altered at least 3 months prior to the start of the treatment. The participants were excluded from the study if they had any plans to harm self or others, if they lost their internet connection for two sessions or did not participate in the treatment for two sessions in a row. Lastly, the participants were excluded from the research if they started a new psychotherapy treatment.

Measures

Demographic characteristics questionnaire:

This involved asking the participants about their age, gender, level of education, and the type of trauma they had experienced.

The Structured Clinical Interview for DSM-5 (SCID-5): PTSD diagnosis was assessed among the study participants using SCID-5. This semi-structured clinical interview guide is employed to assess the main diagnoses enlisted in DSM-5 (27). The participants answered a number of questions that indicated whether they receive the PTSD diagnosis or not. The original English version of SCID-5 has appropriate validity and reliability (sensitivity, specificity, and Kappa $\Rightarrow$ 0.70) (28). The Persian version of SCID-5 was reported to have appropriate internal consistency ($\alpha = 0.95 - 0.99$), test-retest reliability ($r = 0.57 - 0.72$), and a Kappa reliability index of 0.57 – 0.72. In addition to that, the sensitivity, specificity and construct validity of this measure was supported by previous research (29).

The PTSD Checklist for DSM-5 (PCL-5): PTSD symptoms were measured using the 20-item PCL-5. This checklist measures the symptoms of PTSD based on criterion B to E enlisted in DSM-5, on a Likert scale ranging from 0 (Not at all) to 4 (Extremely). The total score is calculated by adding the score of each item. The cut-off score in PCL-5 ranges from 31 to 33, and a score higher than the cut-off score indicates the need for further assessment regarding the diagnosis of PTSD (30). The English version of PCL-5 has appropriate reliability (Internal consistency: $\alpha > 0.79$), and concurrent validity ($r = 0.89$) (83). The Persian version of this measure also has suitable reliability ($\alpha = 0.92$), concurrent validity ($r = 0.74$), and divergent validity ($r = 0.46$) (31).

Beck Depression Inventory-Second Edition (BDI-II): The participants' symptoms of depression were assessed using the BDI-II. This inventory is a 21-item self-report measure that is used to assess symptoms of depression

in the past two weeks using a 4-point Likert-type scale ranging from 0 (Not at all) to 3 (high severity for each symptom) (32). The reliability of this inventory using Cronbach's Alpha was reported to be between 0.83 to 0.96, while the concurrent and divergent validity of the English version of BDI-II was reported to be between 0.82 and 0.94, as well as less than 0.40, respectively (33). Moreover, the Persian version of BDI-II also has appropriate reliability (Internal consistency: $\alpha = 0.86$) and construct validity ($r = 0.90$ and 0.95) (34).

Beck Anxiety Inventory (BAI): Symptoms of anxiety were measured using BAI. This is a 21-item questionnaire that is employed to assess anxiety symptoms, on a Likert scale ranging from 0 (Not at all) to 3 (Severely-it bothered me a lot) (35). The internal consistency for the English version of BAI was reported to 0.92 using Cronbach's Alpha method, and the concurrent and divergent validity of this measure has been reported as $r = 0.51$ and $r = 0.25$, respectively (35). The Persian version of BAI was reported to have appropriate reliability ($r = 0.83$, $p < 0.001$), validity ($r = 0.72$, $p < 0.001$), and internal consistency ($\alpha = 0.92$) (36).

The Positive and Negative Affect Scale (PANAS): Positive and negative affect was assessed using the 20-item PANAS (37). This scale uses a 5-point Likert scale, ranging from 1 (Very slightly or not at all) to 5 (Extremely), to evaluate the recent positive and negative affect of the respondents (38). The English version of PANAS was reported to have appropriate validity (concurrent validity between 0.76 to 0.92, divergent validity: -0.20) and reliability (PANAS-P: $\alpha = 0.86$, PANAS-N: $\alpha = 0.87$) (37). Similarly, the Persian version of PANAS was reported to be both valid and reliable (PANAS-P: $\alpha = 0.87$, PANAS-N: $\alpha = 0.85$) (39).

Procedure

Firstly, the study proposal was approved by the Research Ethics Committee of Shahid

Beheshti University of Medical Sciences, with the code of ethics IR.SBMU.MSP.REC.1399.769. The study method was quasi-experimental. Next, the participants were recruited from a group of respondents who completed a number of demographic questions in addition to PCL-5, online via social networking sites. Afterwards, those who had obtained a score higher than the cut-off score in PCL-5, were invited to take part in a clinical interview via telephone. The length of each interview was an average of 30 minutes. The sample size in the present study were selected using purposive sampling method. The sample size was calculated using the GPower application. By considering the effect size of 0.80, Alpha level of 0.05, and a power of 0.95, the sample size recommended for this study was 19 participants. Considering the possibility of having missing data, the final sample size in this study involved 24 participants (40).

In the next step, those who were eligible for the online treatment were invited to start the I-TF-CBT treatment. After the number of participants were finalized, they were asked to fill up an informed consent form as well as a number of other questionnaires. All participants were informed about the nature of the study and the ethical considerations with regard to taking part in the research. Next, the treatment began. The treatment duration was eight weeks, and the participants completed the questionnaires before, after, and one month after the end date of the online treatment. The procedure of participant selection could be viewed in Figure 1.

Since this was the first time that the treatment protocol was being used in Persian language, the protocol was first translated to Persian, and after it was approved by a group of specialists in the field of clinical psychology, a number of readable and auditory files were prepared for the participants to use during the treatment. The session plan according to the treatment

protocol could be viewed in Table 1. It should be noted that the participants were contacted weekly by a Masters level clinical psychology student under the direct supervision of a Doctorate level clinical psychology supervisor, to answer to any questions that the participants had.

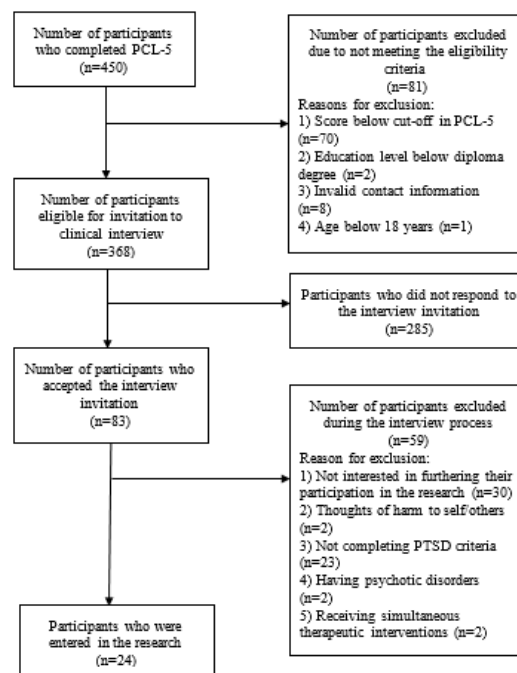


Fig 1. Participants selection procedure

Table 1. Summary of I-TF-CBT session plans

Session	Content
1	Psychoeducation about PTSD Education about grounding technique and applied relaxation
2	Education about: 1) The thoughts, emotions, and behavior cycle, 2) Cognitive distortions. Homework exercises: 1) Finding out pleasure activities, 2) Continuation of applied relaxation exercises.
3	Education about challenging dysfunctional thoughts. Homework exercises: 1) Thought record exercise, 2) Managing worries and rumination, 3) Continuation of applied relaxation exercises.
4	Education about dysfunctional beliefs. Homework exercises: 1) Downward arrow technique, Matrix method for challenging dysfunctional beliefs, Continuation of applied relaxation exercises.
5 & 6	Education about: 1) Thoughts and beliefs that are associated with trauma, 2) Challenging trauma-related thoughts and emotions. Homework exercise: 1) Observing trauma-related thoughts and emotions, 2) Mindfulness exercise.
7	Education about other helpful skills (Effective communication, assertiveness, problem-solving, anger management) and other trauma-related skills.
8	Education about reducing the possibility of getting harmed again, Termination of treatment and relapse prevention.

Statistical Analysis

The analysis of the collected data was conducted using SPSS-version-26 software program. The data were statistically analyzed using descriptive and inferential statistics (Repeated Measures ANOVA). Skewness and kurtosis indexes were used to evaluate the normality of the data distribution

Results

Demographic information

The final study sample involved 19 participants between the ages of 19 and 38 ($M=26.95$, $SD=5.88$). Most of the sample comprised of females (78.9%). More than half of the participants had a bachelor's degree (52.6%), while the other half had either a diploma (21.1%), post-diploma (5.3%), or a Master's degree (21.2%). The type of trauma endured by the study sample were as follows: Rape or sexual assault (42.1%), witnessing a close family member's death (26.3%), domestic abuse (21.1%), mugged in public (5.3%), and drowning in the sea (5.3%).

Inferential analysis

Within-group repeated measures ANOVA was utilized to measure the effectiveness of I-TF-CBT between the study sample in three various time periods. A number of assumptions were evaluated before the inferential analysis of the collected data. One of these assumptions involved evaluating the

normal distribution of the data. This took place using the two indexes of skewness and kurtosis. Since the skewness (41) and kurtosis (42) of the study variables were in the -1.91 and +1.91 range, the results revealed that there was a normal distribution in the research variables and the collected data in the present study.

The other assumption that was considered in this study, was the sphericity assumption for each of the research variables. The results from Mauchly's sphericity test and Greenhouse–Geisser correction were analyzed for the variables, and they showed that while the sphericity test was violated for the two variables of depression and anxiety, it was not violated for the other three variables.

Moreover, the findings revealed that the mean score of the participants for PTSD, depression, anxiety, and positive and negative affect differed from the start point, when measured after the end of the I-TF-CBT treatment, as well as the follow-up phase. The mean differences for each of the variables could be viewed in Table 2.

Table 2. Mean scores in each variable during three different phases

Mean scores in each variable during three different phases			
Variable	Phase	Mean	SD
PTSD	Pre-test	51.16	7.65
	Post-test	32.26	14.04
	Follow-up	26.42	13.53
Depression	Pre-test	32.11	11.36
	Post-test	17.37	11.23
	Follow-up	14.05	9.76
Anxiety	Pre-test	29.58	11.52
	Post-test	18.53	10.60
	Follow-up	17.00	11.60
Positive affect	Pre-test	23.79	7.68
	Post-test	27.79	8.63
	Follow-up	27.58	9.66
Negative affect	Pre-test	32.53	6.23
	Post-test	23.16	7.24
	Follow-up	24.05	9.30

The results of the repeated measures ANOVA could be viewed in Table 3. The sphericity assumption was not violated for PTSD, positive affect, and negative affect. The results showed that I-TF-CBT had a significant effect on the PTSD scores ($F(2,36) = 29.69$, $p = .000$, $\eta^2 = .62$) and negative affect scores

($F(2,36) = 14.40$, $p = .000$, $\eta^2 = .44$) of patients diagnosed with this disorder. This indicates that there was a significant difference in the PTSD and negative affect symptom severity of the participants in the three different phases of pre-treatment, post-treatment, and follow-up. Bonferroni test was utilized to assess the significance of these differences. Within-group comparisons revealed that I-TF-CBT had caused a significant difference in all different phases for both variables, except for the post-treatment-follow-up phase. This confirms the effectiveness of I-TF-CBT in reducing the severity of PTSD and negative affect symptoms among those diagnosed with PTSD. However, the results also showed that this effectiveness was not significant until the follow-up phase.

Although the sphericity assumption was not violated positive affect as a variable, but the results revealed that I-TF-CBT did not have a significant effect on the positive affect scores among patients with PTSD ($F(2,36) 2.93$, $p = .066$, $\eta^2 = .14$). This indicates that there was not a significant difference in the positive affect symptoms of the participants in the three different phases of pre-treatment, post-treatment, and follow-up. This finding was also confirmed by the within-group comparisons of the collected data. As a result, it could be witnessed that I-TF-CBT was not effective in improving positive affect in those diagnosed with PTSD

Table 3. Repeated measures ANOVA results for each of the variables

Variable	Source	Epsilon	df	F	Sig.	Partial Eta Squared
PTSD	Time	Sphericity Assumed	2	26.690	0.000	0.623
	Error (Time)		36			
Depression	Time	Greenhouse-Geisser	1.440	2.060	0.000	0.601
	Error (Time)		25.928			
Anxiety	Time	Greenhouse-Geisser	1.526	18.291	0.000	0.504
	Error (Time)		27.467			
Positive affect	Time	Sphericity Assumed	2	2.935	0.066	0.140
	Error (Time)		36			
Negative affect	Time	Sphericity Assumed	2	14.400	0.000	0.444
	Error (Time)		36			

Since the sphericity assumption was violated for the two variables of depression and anxiety, the results from Greenhouse–Geisser correction were utilized. The results showed that I-TF-CBT had a significant effect on the depression scores ($F(1.44,25.92) = 27.06$, $p = .000$, $\eta^2 = .60$) and anxiety scores PTSD ($F(1.52,27.46) = 18.29$, $p = .000$, $\eta^2 = .50$) among patients with PTSD. This indicates that there was a significant difference in the depression and anxiety symptoms of the participants in the three different phases of pre-treatment, post-treatment, and follow-up phase. Within-group comparisons revealed that I-TF-CBT had caused a significant difference in depression and anxiety symptom severity in all different phases, except for the post-treatment-follow-up phase. This confirms the effectiveness of I-TF-CBT in reducing the severity of depression as well as anxiety symptoms among those diagnosed with PTSD. However, the results also showed that this effectiveness was not significant until the follow-up phase.

Discussion

The present study aimed to investigate if I-TF-CBT is effective in reducing the symptom severity of PTSD, depression, and anxiety, as well as in reducing negative affect, and increasing positive affect among those who were diagnosed with PTSD. The findings showed that all participants had endured a traumatic experience similar to the ones enlisted in criteria A of DSM-5. The results also showed that the mean scores of the participants for PTSD, depression, and anxiety reduced significantly to lower than the cut-off score after the end of the treatment and in the follow-up phase, while this consistent mean score reduction was not witnessed for positive and negative affect among the study sample. Furthermore, the findings revealed that I-TF-CBT was an effective treatment in reducing the severity of PTSD symptoms, as well as depression and anxiety symptoms. This result

was similar to the findings of past studies, in that they reported online CBT treatments, namely I-TF-CBT, to be effective in reducing the symptoms of PTSD (24, 26, 20), anxiety (43, 44, 20), and depression (24, 20, 43, 44) in patients with PTSD. Given that I-TF-CBT uses a range of cognitive and behavioral principles to prevent PTSD, depression, and other behavioral problems (19), and considering that depression and anxiety disorders are among common comorbidities with PTSD that are linked with adverse consequences when accompanied by PTSD (14, 16,17), the findings of this study could be prominent in the early diagnosis and treatment of PTSD and its comorbidities, which could ultimately enhance the mental health of those affected by these disorders.

Moreover, the results of the present study showed that I-TF-CBT could effectively reduce negative affect in PTSD patients, when compared to the baseline condition. Although not many studies have investigated I-TF-CBT with regard to negative affect, but the findings of similar studies showed similar results to the ones found in this study (47). Lastly, the results yielded that positive affect was not significantly increased after the end of the treatment compared to the baseline in the study participants. Although not many studies have investigated this variable and I-TF-CBT (e.g., 45, 46), it could be said that more research is needed to make a better conclusion about this important variable with regard to PTSD. Since previous studies suggest that negative affect could have a significant impact on the comorbidity of other psychiatric disorders with PTSD, namely MDD and GAD (8), it is crucial for these variables to be further evaluated in the treatment of PTSD.

The present study had some strengths and some limitations. One of the strengths of this research was that it was the first to investigate the effectiveness of I-TF-CBT and the five mentioned variables in Iran. It is a hope that

this research would be a starting point for further studies to investigate these variables and other ones in this country and other similar cultures. This study was also accompanied by some limitations. The first limitation was that the interview and treatment was conducted by the researcher, who was aware of the diagnosis and the trauma experience the participants had endured. It would have been better if blinding procedure had taken place during the study. The second limitation involved the design of the study, since it did not comprise a control group. Future studies could conduct the same research with a control group to draw stronger conclusions from the results of this research. Lastly, the follow-up period was limited to one month. It would have been better if a duration of at least 6-months would have been designated for follow-up duration.

Further studies could utilize a similar research design on other comorbid variables with PTSD, such as substance abuse, or suicidal ideation. Moreover, future research could compare I-TF-CBT with and without exposure components among those with PTSD in Iran. Finally, future research could compare the effectiveness of I-TF-CBT with other third wave treatment protocols, such as Dialectical Behavior Therapy (DBT).

To conclude, the findings of the current study highlighted the importance of utilizing online versions of effective first-line treatments for those diagnosed with psychiatric disorders, such as PTSD. The present research was the first to investigate such variables together, especially in the country Iran. It is a hope that the findings of this research would be used by clinicians and researchers to enhance the mental health of those who are in need of remote mental health treatments in Iran and other countries.

Conflict of interest

Author declares no conflict of interest.

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