



Is only one cognitive technique also effective? Results from a randomized controlled trial of two different versions of an internet-based cognitive behavioural intervention for post-traumatic stress disorder in Arabic-speaking countries

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ABSTRACT

Background: Internet-based cognitive-behavioural interventions seem to be effective for the treatment of posttraumatic stress disorder (PTSD) in Arabic-speaking countries in the MENA region. However, due to high prevalence rates of trauma-related mental disorders in this region, it is important to scale up existing Internet-based interventions in order to increase the number of clients.

Objective: The aim of the study was to examine whether a brief Internet-based intervention with one cognitive technique (TF-short, 6 assignments) results in the same PTSD symptom change and lower dropouts compared to a longer intervention with two cognitive techniques (TF-reg, 10 assignments).

Method: A total of 224 Arab participants (67.4% female; $M = 25.3$ years old) with PTSD were randomly assigned to Internet-based CBT with either a TF-reg protocol ($n = 110$) or a TF-short protocol ($n = 114$). Symptoms of PTSD and secondary outcomes (anxiety, depression, somatic complaints, quality of life) were self-assessed online at baseline and post-treatment. Treatment-associated changes were estimated using multigroup latent difference score models.

Results: The overall PTSD score assessed with the PDS decreased by about 15 points in both conditions. The between-group differences (TF-reg vs. TF-short) at post-assessment were non-significant, $\Delta = 0.29$, $p = .896$, $d = 0.02$, 95% CI [-0.30, 0.34]. Like the primary outcome, all within-group changes for the secondary outcomes throughout the intervention were statistically significant and all between-group effects were non-significant. Overall, the dropout rates did not differ between the two conditions, $\chi^2 (1/N = 175) = 0.83$, $p = .364$.

Conclusions: The findings suggest that the shorter condition results in the same symptom change and dropout rate as the longer condition. This highlights the potential of shorter, more scalable Internet-based interventions in socially restricted and (post-)conflict societies.

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关键词

PTSD; 创伤; 阿拉伯语; 网络; CBT; 可塑性; 心理健康

HIGHLIGHTS

- There are no differences regarding PTSD symptom change between an I-CBT with one cognitive technique and a version with two cognitive techniques.
- Results seem to be promising, as they allow CBT to be offered and scaled up in (post)conflict and socially restricted regions.

¿Es solo una técnica cognitiva también eficaz? Resultados de un ensayo controlado aleatorizado de dos versiones diferentes de una intervención cognitivo-conductual basada en Internet para el trastorno de estrés postraumático en países de habla árabe

Antecedentes: Las intervenciones cognitivo-conductuales basadas en Internet parecen ser efectivas para el tratamiento del trastorno de estrés postraumático (TEPT) en los países de habla árabe de la región MENA. Sin embargo, debido a las altas tasas de prevalencia de trastornos mentales relacionados con el trauma en esta región, es importante escalar las intervenciones existentes basadas en Internet para aumentar el número de clientes.

Objetivo: El propósito del estudio fue examinar si una intervención breve basada en Internet con una técnica cognitiva (TF-corta, 6 asignaciones) da como resultado el mismo cambio sintomático del TEPT y menos abandonos en comparación con una intervención más prolongada con dos técnicas cognitivas (TF-reg, 10 asignaciones).

Método: Un total de 224 participantes árabes (67,4% mujeres; $M = 25,3$ años) con TEPT fueron asignados aleatoriamente a TCC basada en Internet con un protocolo TF-reg ($n = 110$) o un protocolo TF-corta ($n = 114$). Los síntomas del TEPT y los resultados secundarios (ansiedad, depresión, quejas somáticas, calidad de vida) fueron autoevaluadas en línea al inicio y al finalizar el tratamiento. Los cambios asociados al tratamiento se estimaron utilizando modelos de puntuación de diferencia latente multigrupo.

Resultados: El puntaje general de TEPT evaluado con la PDS disminuyó aproximadamente 15 puntos en ambas condiciones. Las diferencias entre grupos (TF-reg vs. TF-corta) en la evaluación posterior no fueron significativas, $\Delta = 0,29$, $p = .896$, $d = 0,02$, IC del 95% [-0,30, 0,34]. Al igual que el resultado primario, todos los cambios dentro del grupo para los resultados secundarios a lo largo de la intervención fueron estadísticamente significativos y todos los efectos entre los grupos no fueron significativos. En general, las tasas de abandono no difirieron entre las dos condiciones, $\chi^2 (1/N = 175) = 0,83$, $p = .364$.

Conclusiones: Los hallazgos sugieren que la condición más corta da como resultado el mismo cambio de síntomas y la misma tasa de abandono que la condición más larga. Esto resalta el potencial de intervenciones más breves y escalables basadas en Internet en sociedades socialmente restringidas y (post) conflicto.

只有一种认知技术也有效吗？来自阿拉伯语国家的两种不同版本的创伤后应激障碍网络认知行为干预随机对照试验的结果

背景: 网络认知行为干预似乎对 MENA 地区阿拉伯语国家的创伤后应激障碍 (PTSD) 治疗有效。然而, 由于该地区创伤相关精神障碍的患病率很高, 扩展现有网络干预措施以增加使用者数量非常重要。

目的: 本研究旨在考查使用一种认知技术的简版网络干预 (TF-reg, 10 项任务) 相较于使用两种认知技术 (TF-short, 6 项任务) 的长期干预, 是否会导致相同的 PTSD 症状变化和更低的流失率。

方法: 共有 224 名患有 PTSD 的阿拉伯参与者 (67.4% 女性; $M = 25.3$ 岁) 被随机分配到使用 TF-reg 方案 ($n = 110$) 或 TF-short 方案 ($n = 114$) 的网络 CBT。在基线和治疗后在线自我评估 PTSD 症状和次要结果 (焦虑, 抑郁, 躯体不适, 生活质量)。使用多组潜在差分模型估计治疗相关变化。

结果: 在两种条件下, 使用 PDS 评估的总体 PTSD 得分均下降了约 15 分。评估后的组间差异 (TF-reg 与 TF-short) 不显著, $\Delta = 0,29$, $p = .896$, $d = 0,02$, 95% CI [-0,30, 0,34]。与主要结果一样, 整个干预过程中次要结果的所有组内变化都统计显著, 所有组间效应均不显著。总体而言, 两种条件的流失率没有差异, $\chi^2 (1/N = 175) = 0,83$, $p = .364$ 。

结论: 结果表明, 短期条件与长期条件有相同的症状变化和流失率。这凸显了在社交受限和冲突 (后) 社会中更短, 更可塑的网络干预的潜力。

1. Introduction

The World Health Organization (WHO) has reported a particularly high prevalence of mental disorders in conflict and war regions, i.e. 15.3% posttraumatic stress disorder (PTSD), 10.8% depression, 21.7% anxiety disorders, (Charlson et al., 2019) as compared to global prevalence estimates (4.4% depression, World Health Organization [WHO], 2017; 3.9% PTSD, Koenen et al., 2017). As the countries of the Middle East and North Africa region (MENA) have been especially affected by conflicts and wars, mental health is a major public health concern in this region, with PTSD, anxiety and depression being found to be particularly prevalent (Charara et al., 2018). A study which used epidemiological modelling estimated that approximately 2.2 million Syrian people suffer from PTSD (Charlson, Lee, Diminic, and Whiteford, 2016). Moreover, a study examining the distribution of disability-adjusted life-years (DALYs) due to mental disorders in the Eastern Mediterranean Region in 2015 found that depressive (42.1%) and anxiety disorders (21.5%) were the greatest contributors, with women having the highest rates (Charara et al., 2018). In addition to war and conflict as social determinants for the development and maintenance of mental disorders, further frequent risk factors include poverty, social exclusion and gender disadvantages (Patel et al., 2018).

Evidence-based psychotherapy is not very common in the MENA region. On the one hand, the mental health infrastructure has either never been fully

established or has been destroyed during war and conflicts (Letaief et al., 2021). On the other hand, barriers such as low health literacy, poverty as well as fear of stigmatization result in a low utilization of existing services. Many of these treatment barriers are reported by trauma survivors in general, and are not specific to the Arabic-speaking countries in the MENA region (Kantor, Knefel, and Lueger-Schuster, 2017).

Interventions that are offered online can help to bridge these general barriers as they are geographically and temporally independent. The visual anonymity of the intervention may also contribute to lowering the barriers related to the fear of stigmatization as well as feelings of shame. Therefore, Internet-based interventions (IBIs) provide a unique opportunity to offer psychological support and have been shown to be efficacious for a variety of mental disorders, e.g. PTSD (Lewis, Roberts, Simon, Bethell, & Bisson, 2019), depression (Königbauer, Letsch, Ebler, David, & Harald, 2017). For PTSD, internet-based cognitive-behavioural therapy (i-CBT) is superior to waitlist and treatment-as-usual in reducing PTSD symptoms (Lewis et al., 2019) and appears to be an acceptable intervention for adults (Simon et al., 2019). Studies have also shown that guidance by a therapist leads to larger treatment effects than self-guided interventions (Lewis et al., 2019).

A survey with respondents from various Arabic-speaking countries underlined the significant potential of Internet-based delivery, as the majority of

respondents, and especially women, indicated that they would be willing to try IBIs (Kayrouz et al., 2018). In addition, a recent meta-analysis of the literature on cognitive-behavioural therapy (CBT) in Arab populations provided first insights that CBT is also effective in this cohort (Kayrouz et al., 2018). Moreover, it showed that Internet-based CBT in this cohort has yielded large effect sizes which are comparable to those found in studies in Western populations (PTSD: $g = 2.08$ in Arab adult population vs. $g = 2.59$ in Western population; depression: $g = 1.26$ in Arab adult population vs. $g = 1.16$ in Western population, Kayrouz et al., 2018; Stewart & Chambless, 2009). Kayrouz et al. (2018) also reported an average dropout rate of 26%, which is comparable to rates in Western populations (Fernandez, Salem, Swift, and Ramtahal, 2015). The dropout rates in the Internet-delivered treatments in Arab countries vary strongly (9–64%, Kayrouz et al., 2018), with half of the studies showing large dropout rates. The variance is in line with other findings, as a systematic review with internet-based PTSD studies in different countries shows (e.g. Sweden, UK, Iraq, USA, Australia, Simon et al., 2019). The majority of high dropout rates in the Arab meta-analysis could be explained by the specific trauma focus, which has been found to be a predictor of higher dropout rates (Simon et al., 2019).

In view of the aforementioned findings, Internet-based settings might therefore be able to increase the utilization of mental health services in Arabic-speaking countries in the MENA region, as they address some of the barriers which face-to-face services cannot (e.g. service availability, fear of stigmatization, Gearing et al., 2013). However, due to the above-mentioned high prevalence rates of mental disorders in the MENA region, it is important to also scale up existing (Internet-based) interventions. This scalability can be operationalized by short and manualised online interventions that allow for an increase in the number of clients without the necessity for more human resources (Sijbrandij et al., 2017). Furthermore, some barriers to engage in psychotherapeutic treatment, as well as challenges in terms of completing the treatment, are related specifically to the political and social situation in this region. The political unrest in some of the countries, as well as cultural (i.e. endangerment of female participants due to existing gender norms which do not allow women to visit a doctor on their own) and treatment-related aspects (e.g. length of treatment) remain as barriers and challenges (Ashfaq et al., 2020; Nguyen et al., 2019).

To scale up interventions and address these specific barriers and challenges, we developed a shorter version of an already existing Internet-based cognitive-behavioural intervention that was previously found to significantly reduce PTSD symptoms in individuals

living in Arabic-speaking countries in the MENA region ($d = 0.92$, dropout rate: 41%) (Knaevelsrud, Brand, Lange, Ruwaard, & Wagner, 2015). The existing writing-based intervention consists of three components with ten writing assignments: 1. written traumatic exposure, 2. cognitive restructuring, and 3. cognitive elaboration in the form of social sharing (Knaevelsrud et al., 2015). By shortening the intervention (six assignments and only one of the two cognitive techniques), we intended to reduce the barriers and challenges with respect to existing social restrictions and the preference for short interventions (Nguyen et al., 2019), and thus increase the number of patients (i.e. scale up the intervention).

To be able to offer a shorter version, it is crucial to take a closer look at the efficacy of CBT for PTSD in general. Exposure-based and cognitive approaches are first-line interventions which have proven to be effective (Lewis, Roberts, Andrew, Starling, & Bisson, 2020). However, findings regarding the superiority of either exposure or cognitive treatment for PTSD are inconsistent (Horesh, Qian, Freedman, & Shalev, 2017; Peterson et al., 2020; Sloan, Marx, Lee, & Resick, 2018; Sloan, Marx, & Resick, 2016). International guidelines for the treatment of PTSD recommend both the elaboration and processing of traumatic memories as well as the cognitive elaboration of trauma-related meanings (National Institute for Health and Clinical Excellence [NICE], 2018). In terms of IBIs, CBT seems to be more beneficial for PTSD than non-CBT approaches (Lewis et al., 2019). Based on these findings, the existing Internet-based intervention (TF-reg) was shortened by removing the longer cognitive restructuring part, resulting in a new brief version (TF-short) that consists of the components of exposure and a short cognitive elaboration.

In sum, determining the efficacy of a brief IBI might be of considerable relevance, as such an intervention would enable more patients to be treated by a single therapist. Moreover, a brief intervention might be more applicable in (post-)conflict-affected and socially restricted regions, where people often cannot attend longer therapeutic interventions and mostly prefer short treatments (Al-Krenawi & Graham, 2000). Hence, the aim of the present study was to shed more light on this area of research by assessing a brief scalable approach for individuals with PTSD in Arabic-speaking countries in the MENA region. The present study therefore examines the difference in PTSD symptom change between a brief protocol with only one short cognitive module (TF-short) and the existing longer and more complex Internet-based intervention for PTSD (TF-reg) (Knaevelsrud et al., 2015). We expected that the two conditions would yield the same symptom change in PTSD symptoms, as both contain trauma confrontation as well as one cognitive technique (i.e. reflection on the meaning of

the trauma) and as there is substantial overlap in the assumed mechanisms underlying the efficacy (NICE, 2018). We also expected that the dropout rate would be lower in the brief intervention (i.e. proportion of individuals who completed at least six assignments) as the literature shows that shorter approaches tend to be preferred (Nguyen et al., 2019). As PTSD is frequently comorbid with other mental disorders and evidence suggested that IBIs for PTSD affect also secondary outcomes (Lewis et al., 2019), a similar change in depressive and anxiety symptoms, somatic complaints and quality of life is assumed in both interventions.

2. Methods

The study is part of a project for the treatment of PTSD and depression for patients living in Arabic-speaking countries. The Ethics Committee of the University of Leipzig (Germany) approved the present study (236-11-22082011).

2.1. Participants

We recruited participants between May 2013 and October 2015 through the project's website and social media appearance. Eligible participants were Arabic-speaking adults over the age of 17 years, who had a history of trauma and met diagnostic criteria for PTSD according to the DSM-IV (American Psychiatric Association [APA], 1994) as assessed in a telephone- or voice over IP-administered clinical interview (Composite International Diagnostic Interview, CIDI, Kessler et al., 2004). Exclusion criteria were also assessed with the CIDI (Kessler et al., 2004), and were as follows: risk of suicide, psychotic symptoms, substance abuse, simultaneous psychotherapeutic treatment, and no stable dose of psychopharmacological medication three months prior to inclusion in the study. These criteria are commonly used in IBIs for PTSD (Simon et al., 2019). Depressive symptoms were assessed using the Beck Depression Inventory II (BDI-II, Beck, Steer, & Brown, 1996) and participants who scored above the cut-off of 45 were excluded.

Overall, $n = 224$ Arabic-speaking adults, mainly from Egypt (22.5%), Saudi Arabia (17.1%), Algeria (11.3%), Syria (10.7%), Morocco (8.2%) and Palestine (5.4%), were randomized to the TF-reg ($n = 110$) or TF-short ($n = 114$) condition. The average age was 25.3 years ($SD = 5.9$); 67.4% ($n = 151$) were female. The majority of the sample was highly educated, with approximately 75% currently studying at a university or having already completed a university degree. Participants reported an average of 5.14 ($SD = 3.34$) different traumatic events (according to a trauma list from the Posttraumatic Stress Diagnostic Scale part I,

Table 1. Sample characteristics of the total and subpopulation.

Characteristic	Total ($N = 224$)	TF-reg ($n = 110$)	TF-short ($n = 114$)
Age	$M (SD)$ 25.3 (5.9)	25.5 (6.1)	25.1 (5.7)
Female Gender	$n (%)$ 151 (67%)	71 (65%)	80 (70%)
Marital Status			
Single	$n (%)$ 157 (70%)	82 (75%)	75 (66%)
Married	$n (%)$ 49 (22%)	21 (19%)	28 (25%)
Divorced	$n (%)$ 16 (7%)	6 (5%)	10 (9%)
Widowed	$n (%)$ 2 (1%)	1 (1%)	1 (1%)
Education			
University Degree	$n (%)$ 109 (49%)	55 (50%)	54 (47%)
University Student	$n (%)$ 58 (26%)	28 (25%)	30 (26%)
High School Student/Qualifications	$n (%)$ 52 (23%)	25 (23%)	27 (24%)
Elementary School	$n (%)$ 5 (2%)	2 (2%)	3 (3%)
Migrated	$n (%)$ 62 (28%)	29 (26%)	33 (29%)
Clinical Characteristics			
PDS Overall	$M (SD)$ 32.4 (9.3)	31.9 (9.3)	32.9 (9.4)
PDS re-experience	$M (SD)$ 8.1 (4.2)	7.9 (4.1)	8.4 (4.3)
PDS arousal	$M (SD)$ 10.6 (3.4)	10.5 (3.4)	10.7 (3.4)
PDS avoidance	$M (SD)$ 13.6 (4.3)	13.4 (4.1)	13.8 (4.5)
HSCL Anxiety	$M (SD)$ 1.8 (0.7)	1.8 (0.7)	1.8 (0.6)
HSCL Depression	$M (SD)$ 2.1 (0.5)	2.1 (0.5)	2 (0.5)
SCL-90-R Somatic	$M (SD)$ 1.6 (0.9)	1.7 (0.9)	1.6 (0.9)
QoL	$M (SD)$ 10.6 (5.1)	10.1 (4.4)	11.1 (5.7)

PDS = Posttraumatic Stress Diagnostic Scale, HSCL = Hopkins Symptom Checklist, SCL-90-R Somatic = somatization subscale of Symptom Checklist-90-R, QoL = EUROHIS-QOL-8 Quality of Life, TF-reg = intervention with cognitive restructuring, TF-short = intervention without cognitive restructuring, M = Mean, SD = Standard Deviation

Foa, 1995). The most frequently reported traumatic events were 'sexual intercourse before reaching the age of 18 with someone 5 years older than you' ($n = 127$), 'proximity to death' ($n = 88$), 'sexual abuse by family member or friend' ($n = 71$) and 'sexual abuse by a stranger' ($n = 70$). Table 1 summarizes all further sociodemographic and clinical characteristics.

2.2. Procedures

People interested in the programme (for PTSD or depression) were able to register on a web platform and complete the screening questionnaires in a password-protected portal. The screening included questionnaires covering demographic data (e.g. age, gender), exclusion criteria and outcome measures. After being successfully screened, participants underwent a telephone- or voice over IP-administered clinical interview (CIDI, Kessler et al., 2004) conducted by trained interviewers. Based on the interview, participants were assigned to PTSD or depression treatment. Since both disorders are often comorbid, the interview was additionally relevant to determine which disorder should be the focus of the applied treatment. In the present study, only PTSD treatment will be discussed, as cognitive behavioural intervention for depression involves other therapeutic techniques and thus has differing goals (e.g. behavioural activation, identifying dysfunctional thoughts). Participants in this study were only treated with the respective PTSD condition and were not part of the depression treatment at any time.

All of the 224 participants who had a diagnosis of PTSD provided informed consent online and were randomly assigned with the help of a computer-generated randomization list (randomization 1:1) to either the longer Internet-based cognitive-behavioural intervention (TF-reg group; $n = 110$), or the equivalent intervention without the cognitive restructuring module, (TF-short group; $n = 114$). Figure 1 shows the participant flow of the programme (for PTSD and depression).

2.3. Measures

Several questionnaires were used to explore change as well as differences in change throughout the intervention. All measures were assessed online at baseline (pre-treatment) and post-treatment. All questionnaires had already been translated into standard Arabic, and subsequently blind back-translated to the original version for the TF-reg study (Knaevelsrud et al., 2015).

2.3.1. PTSD severity

The Posttraumatic Stress Diagnostic Scale (PDS) (Foa, 1995) is a 17-item self-report instrument that assesses symptoms of PTSD on a 4-point rating scale ranging from *never* (0) to *almost always* (3), with a total score ranging between 0 and 51. Scores between 1 and 10 indicate *mild*, scores between 11 and 20 suggest *moderate*, scores between 21 and 35 *moderate to severe* and scores higher than 35 *severe* PTSD. A recent study found support for the online application of the PDS as a reasonable approach to measure PTSD (Selmo, Koch, Brand, Wagner, & Knaevelsrud, 2016). In the present study, Cronbach’s alpha was $\alpha = .80$.

2.3.2. Anxiety and depression

The mean subscale scores of the Hopkins Symptom Checklist-25 (HSCL-25) (Mollica, Wyshak, De Marneffe, Khuon, & Lavelle, 1987) were used to measure symptoms of depression and anxiety. Each of the 25 items is rated on a 4-point rating scale ranging

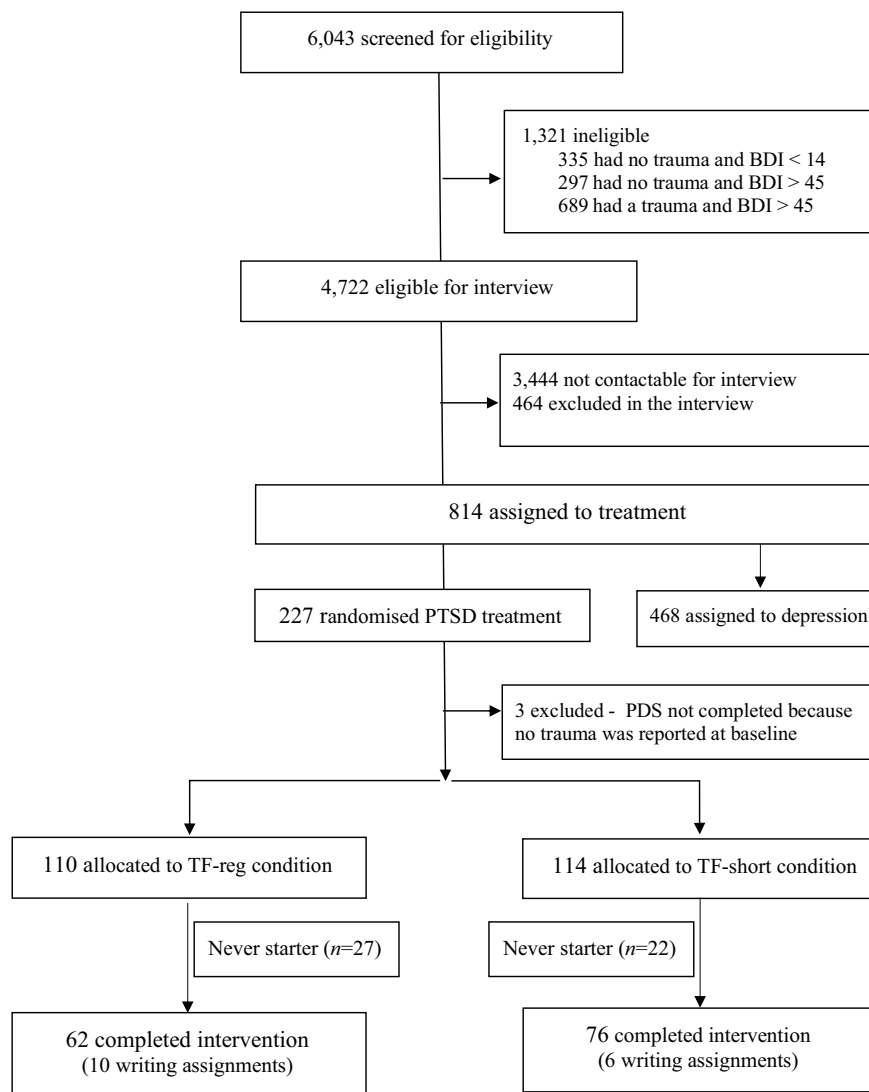


Figure 1. Participant flow for PTSD interventions.

between *not at all* (1) and *extremely* (4). The Arabic version of the HSCL-25 has shown appropriate psychometric properties when applied in the online context (Selmo et al., 2016). Internal consistency was $\alpha = .81$ for the depression and $\alpha = .84$ for the anxiety subscale.

2.3.3. Somatic complaints

The somatization subscale of the Symptom Checklist-90-Revised (SCL-90-R) (Derogatis & Savitz, 1999) was used to assess somatic complaints. This subscale comprises 12 items, each rated on a 5-point Likert scale from *not at all* (0) to *extremely* (4). Internal consistency was $\alpha = .91$

2.3.4. Quality of life

The 8-item scale EUROHIS-QOL-8, (Schmidt, Mühlhan, & Power, 2006) which measures quality of life in four domains (psychological, physical, social, environmental), is derived from the WHOQOL-BREF. Items are rated on a 5-point scale ranging from *not at all* (1) to *completely* (5), with higher mean scores indicating a better quality of life. In a cross-cultural study, the EUROHIS-QOL-8 showed an acceptable performance (Da Rocha, Power, Bushnell, & Fleck, 2012). In the present study, internal consistency was $\alpha = .68$.

2.4. Interventions: TF-reg vs. TF-short

The present interventions are based on a Dutch web-based cognitive-behavioural approach for PTSD (Interapy, Ruwaard, Lange, Schrieken, & Emmelkamp, 2011) which was translated into modern standard Arabic and culturally shaped (Knaevelsrud et al., 2015). Both interventions comprised two weekly 45-min structured writing assignments. A secure password-protected web application was used for the delivery of both interventions.

2.4.1. Intervention with two cognitive techniques (Cognitive restructuring and processing; TF-reg)

The TF-reg intervention comprised three components with ten writing assignments over a period of five weeks: 1) written self-confrontation (imaginal exposure) by describing the traumatic event and its circumstances in as much detail as possible, in the first person and in the present tense (four assignments); 2) cognitive restructuring to reflect on feelings of guilt, dysfunctional automatic cognitions and to adjust unrealistic assumptions (four assignments); and 3) cognitive processing in the form of reflection on and meaning of the trauma for the individual by writing a supportive letter to oneself at the time of the trauma, so-called social sharing (two assignments). At the beginning of each component, (psychoeducational) information on the principles of the treatment phase

was given. The TF-reg protocol proved to be efficacious in a previous randomized controlled trial with Arabic-speaking patients (Knaevelsrud et al., 2015).

2.4.2. Intervention with one cognitive technique (Cognitive processing; TF-short)

The TF-short intervention was identical to the TF-reg protocol but without the second component of cognitive restructuring with four assignments. Consequently, the TF-short protocol consisted of two components (components 1 and 3 of TF-reg): 1) written self-confrontation with the traumatic event (four assignments), and 2) cognitive processing in the form of reflection on and meaning of the trauma for the individual, i.e. social sharing (two assignments). The TF-short protocol comprised six writing assignments over a period of three weeks.

2.4.3. Counsellors

Eight native Arabic-speaking counsellors living in Egypt or Germany conducted both interventions. Counsellors had either many years of practical experience as psychosocial counsellors or a bachelor's degree in psychology or psychology-related disciplines. During the period of the study, counsellors were trained in multiple and continuous workshops on the handling of the treatment manual and specific aspects of Internet-based treatment. Moreover, they attended monthly supervision meetings. In both interventions, the counsellors gave written feedback on the participants' writing assignments and further instructions on the next assignment within 48 hours. The feedback and instructions consisted of a standard manual as well as individual feedback tailored to each participant's needs. Telephone contact with the participants was limited to technical problems or emergency situations (e.g. suicidal thoughts).

2.5. Statistical analysis

In a first step, we compared individuals who never began working on the treatment with individuals who completed at least one writing assignment (never-starter versus starter) with regard to sociodemographic and clinical characteristics. Additionally, we investigated whether the proportion of individuals who completed at least six assignments differed between the two groups. We chose the completion of six assignments as reference because this indicates treatment completion in the TF-short condition. Group differences were investigated using Welch or Chi-square tests. Treatment-associated changes were estimated using multigroup latent difference score models. Overall, this approach is comparable to conducting *t*-tests/ANOVAs with treatment condition as between-group factor, but facilitates the inclusion of multiple imputed datasets (Newsom, 2015). We computed changes from

pre-assessment (PRE) to post-assessment (POST), as well as between-group differences in change with regard to these assessment periods. The mean of the change scores reflects the average improvements in units of the questionnaire. Overall, these unstandardized effect estimates are informative since they are not affected by between-group differences in variability. Cohen's *d*-like effect measures were computed by standardizing the change scores on the pooled standard deviations of the change score (between-group effect) or the within-group standard deviation (within-group effect). We used R (RStudio Team, 2019) and Mplus 8.0 (Muthén & Muthén, 2017) to carry out all analyses.

2.5.1. Missing data

We performed an intention-to-treat analysis (ITT) that included all randomized individuals independent of actual treatment usage. The rate of missing questionnaire data at post-assessment was about 45%, mainly due to the large proportion of individuals who did not start to work with the provided treatment material after randomization (about 25%). Missing data were dealt with using multiple imputation (50 iterations, 100 imputed datasets) via predictive mean matching in R using mice (Buuren & Groothuis-Oudshoorn, 2011). Therefore, the reported results are pooled estimates across all imputed datasets. The imputation model included all variables used in later analysis in addition to age and gender. Data were imputed under the *missing at random* (MAR) assumption, implying that the included covariates are sufficient to produce unbiased effect estimates. While this is a tenable starting point (Collins, Schafer, & Kam, 2001; Enders, 2010), since this assumption is not testable, recent guidelines recommend performing a sensitivity analysis to explore whether deviations from the MAR assumption influence study conclusions (O'Kelly & Ratitch, 2014). One simple and transparent strategy is to impute the data first and then increase imputed values of individuals who did not complete the treatment. This implies the idea that the imputation model was too optimistic and has underestimated the actual symptom load. In the current manuscript, three conditions were used, and we increased (or decreased in the case of quality of life) the individual imputed scores by 25%, 50% and 75%.

3. Results

3.1. Participants' baseline characteristics

The PDS scores at baseline assessment ranged between 5 and 51, with a mean of 32.4 ($SD = 9.3$). According to the suggested PDS-based severity classification, the majority of participants showed *moderate to severe*

($n = 112, 50\%$) or *severe* symptoms of PTSD ($n = 90, 40\%$). Only 10% ($n = 22$) were classified as having *mild to moderate* symptom load. In addition, levels of symptoms of depression ($M = 2.1, SD = 0.5$) and anxiety ($M = 1.8, SD = 0.7$) were elevated. Table 1 summarizes all clinical characteristics at baseline.

3.2. Attrition and treatment usage

Overall, 19.3% ($n = 22$) of the participants of the TF-short condition and 24.5% ($n = 27$) of the participants of the TF-reg condition did not start to work with the treatment. These rates did not differ significantly between the treatment arms, $\chi^2 (1/N = 224) = 0.90, p = .342$. Moreover, there were no significant differences between starters and never-starters on any sociodemographic or clinical variables (see Table 2).

The rate of individuals who completed six writing assignments (TF-reg condition: 77.1% vs. TF-short condition: 82.6%) did not differ significantly, $\chi^2 (1/N = 175) = 0.83, p = .364$. Compared to this group which completed at least six assignments, individuals who left the intervention prior to completing the sixth assignment did not differ significantly on any socio-demographic or clinical variable (see Table 3). In the

Table 2. Sociodemographic sample characteristics at baseline assessment of starters and never-starters.

Characteristic		Never Starter ($n = 49$)	Starter ($n = 175$)	t (df) ^a	p
Age	M (SD)	24.1 (4.8)	25.6 (6.1)	1.794 (95.37)	.076
Female Gender	n (%)	32 (65%)	119 (68%)	0.126 (1) ^b	.722
Marital Status				Fisher ^c	.856
Single	n (%)	36 (73%)	121 (69%)		
Married	n (%)	9 (18%)	40 (23%)		
Divorced	n (%)	4 (8%)	12 (7%)		
Widowed	n (%)	0 (0%)	2 (1%)		
Education				Fisher ^c	.844
University Degree	n (%)	25 (51%)	84 (48%)		
University Student	n (%)	12 (24%)	46 (26%)		
High School					
Student/Qualifications	n (%)	12 (24%)	40 (23%)		
Elementary School	n (%)	0 (0%)	5 (3%)		
Migrated	n (%)	17 (35%)	45 (26%)	1.542 (1)	0.214
PDS Overall	M (SD)	32 (11)	32.5 (8.8)	0.326 (66.44)	.745
PDS re-experience	M (SD)	8.6 (4.5)	8 (4.1)	-0.867 (71.91)	.389
PDS arousal	M (SD)	10.1 (3.6)	10.8 (3.3)	1.081 (71.7)	.283
PDS avoidance	M (SD)	13.2 (4.7)	13.7 (4.2)	0.746 (71.32)	.458
HSCL Anxiety	M (SD)	1.7 (0.7)	1.8 (0.7)	0.796 (72.2)	.429
HSCL	M (SD)	2.1 (0.5)	2 (0.5)	-0.559 (74.47)	.578
Depression					
SCL-90-R Somatic	M (SD)	1.8 (1)	1.6 (0.9)	-0.894 (74.99)	.374
QoL	M (SD)	10.1 (4.5)	10.8 (5.3)	0.831 (88.27)	.408

^aGroup comparison based on Welch test, if not declared otherwise. ^bChi-Square Test of Independence. ^cFisher's Exact Test. PDS = Posttraumatic Stress Diagnostic Scale, HSCL = Hopkins Symptom Checklist, SCL-90-R Somatic = somatization subscale of Symptom Checklist-90-R, QoL = EUROHIS-QOL-8 Quality of Life, M = Mean, SD = Standard Deviation

Table 3. Characteristics of individuals who completed or did not complete at least six writing assignments.

Characteristic	Statistic	At least 6 (n = 140)	Fewer Than 6 (n = 35)	t (df) ^a	p
Age	M (SD)	25.7 (6.5)	25.5 (4.3)	-0.235 (76.8)	.815
Female Gender	n (%)	97 (69%)	22 (63%)	0.532 (1) ^b	.466
Marital Status				Fisher ^c	.401
Single	n (%)	100 (71%)	21 (60%)		
Married	n (%)	29 (21%)	11 (31%)		
Divorced	n (%)	9 (6%)	3 (9%)		
Widowed	n (%)	2 (1%)	0 (0%)		
Education				Fisher ^c	.421
University Degree	n (%)	67 (48%)	17 (49%)		
University Student	n (%)	34 (24%)	12 (34%)		
High School					
Student/Qualifications	n (%)	35 (25%)	5 (14%)		
Elementary School	n (%)	4 (3%)	1 (3%)		
Migrated	n (%)	35 (25%)	10 (29%)	0.187 (1)	0.665
PDS Overall	M (SD)	32.6 (8.9)	32.2 (8.8)	-0.257 (52.55)	.798
PDS re-experience	M (SD)	8.1 (4.2)	7.8 (3.8)	-0.362 (57.19)	.719
PDS arousal	M (SD)	10.8 (3.3)	10.4 (3.4)	-0.662 (51.18)	.511
PDS avoidance	M (SD)	13.7 (4.3)	13.9 (4.2)	0.324 (52.93)	.747
HSCL Anxiety	M (SD)	1.8 (0.6)	1.8 (0.7)	-0.217 (50.12)	.829
HSCL Depression	M (SD)	2 (0.5)	2.1 (0.5)	0.199 (51.32)	.843
SCL-90-R Somatic	M (SD)	1.6 (0.9)	1.8 (0.9)	1.446 (53.09)	.154
QoL	M (SD)	10.5 (5.4)	11.8 (4.5)	1.41 (61.5)	.164

^aGroup comparison based on Welch test, if not declared otherwise. ^bChi-Square Test of Independence. ^cFisher's Exact Test. PDS = Posttraumatic Stress Diagnostic Scale, HSCL = Hopkins Symptom Checklist, SCL-90-R Somatic = somatization subscale of Symptom Checklist-90-R, QoL = EUROHIS-QOL-8 Quality of Life, M = Mean, SD = Standard Deviation

TF-reg condition, 62 (74.7%) participants completed all 10 writing assignments.

3.3. Intervention-associated changes

In the following section, the within- and between-group changes are reported for each of the outcome measures. Table 4 summarizes all within- and between-group effect estimates with corresponding standard errors

Table 4. Within- and between-group ITT effect estimates.

Outcome	Group	Within-Group Change				Between-Group Differences			
		M (SE)	p	d	[95% CI]	M (SE)	p	d	[95% CI]
PDS – Overall	TF-reg	-15.03 (1.64)	<.001	-1.08	[-1.36, -0.79]	0.29 (2.22)	.896	0.02	[-0.30, 0.34]
	TF-short	-14.73 (1.45)	<.001	-1.13	[-1.44, -0.82]				
PDS – Re-Experience	TF-reg	-3.88 (0.65)	<.001	-0.70	[-0.99, -0.41]	0.04 (0.87)	.960	0.01	[-0.31, 0.32]
	TF-short	-3.83 (0.58)	<.001	-0.72	[-0.99, -0.45]				
PDS – Avoidance	TF-reg	-6.16 (0.86)	<.001	-0.95	[-1.28, -0.62]	0.02 (1.14)	.983	0.00	[-0.34, 0.35]
	TF-short	-6.14 (0.75)	<.001	-0.97	[-1.27, -0.66]				
PDS – Arousal	TF-reg	-4.99 (0.66)	<.001	-0.94	[-1.25, -0.63]	0.22 (0.88)	.800	0.04	[-0.29, 0.38]
	TF-short	-4.76 (0.56)	<.001	-0.97	[-1.26, -0.68]				
HSCL – Depression	TF-reg	-0.78 (0.13)	<.001	-0.80	[-1.09, -0.51]	-0.17 (0.16)	.272	-0.19	[-0.53, 0.15]
	TF-short	-0.95 (0.09)	<.001	-1.16	[-1.45, -0.88]				
HSCL – Anxiety	TF-reg	-0.56 (0.13)	<.001	-0.58	[-0.87, -0.30]	-0.22 (0.16)	.160	-0.25	[-0.59, 0.10]
	TF-short	-0.78 (0.10)	<.001	-0.93	[-1.21, -0.66]				
SCL-90-R Somatic	TF-reg	-0.54 (0.14)	<.001	-0.48	[-0.73, -0.23]	-0.12 (0.17)	.489	-0.11	[-0.43, 0.21]
	TF-short	-0.65 (0.10)	<.001	-0.70	[-0.93, -0.48]				
Quality of Life	TF-reg	5.11 (1.02)	<.001	0.67	[0.41, 0.94]	0.42 (1.32)	.748	0.06	[-0.28, 0.39]
	TF-short	5.53 (0.89)	<.001	0.71	[0.48, 0.94]				

All estimates are pooled across 100 imputed data sets. PDS = Posttraumatic Stress Diagnostic Scale, HSCL = Hopkins Symptom Checklist, SCL-90-R Somatic = somatization subscale of Symptom Checklist-90-R, Quality of Life = EUROHIS-QOL-8, TF-reg = intervention with two cognitive techniques, TF-short = intervention with one cognitive technique, ITT = intent to treat, M = Mean, SE = Standard Error, d = Cohen's d, CI = confidence interval.

and 95% confidence levels. Given that eight outcome measures were tested, Bonferroni correction was applied and differences were only considered statistically significant at $p < .006$.

3.3.1. Posttraumatic symptoms

The overall PDS score decreased by about 15 points in both treatment conditions. The between-group differences (TF-reg vs. TF-short) at post-assessment were small and non-significant, $\Delta = 0.29$, $p = .89$, $d = 0.02$, 95% CI [-0.30, 0.34]. The same pattern emerged for the subscales avoidance, $\Delta = 0.02$, $p = .98$, $d = 0.00$, 95% CI [-0.34, 0.35], re-experience, $\Delta = 0.04$, $p = .96$, $d = 0.01$, 95% CI [-0.31, 0.32], and arousal, $\Delta = 0.22$, $p = .80$, $d = 0.04$, 95% CI [-0.29, 0.38].

3.3.2. Secondary outcome measures

Like the primary outcome measure, all within-group changes throughout the intervention were statistically significant using the ITT sample, with standardized effect estimates ranging between $d = 0.70$ (quality of life, TF-short) and $d = -1.16$ (depression, TF-short). All between-group effect estimates (TF-reg vs. TF-short) were descriptively small and non-significant (depression, $\Delta = -0.17$, $p = .27$, $d = -0.19$, 95% CI [-0.53, 0.15], anxiety, $\Delta = -0.22$, $p = .16$, $d = -0.25$, 95% CI [-0.59, 0.10], somatic complaints, $\Delta = -0.12$, $p = .49$, $d = -0.11$, 95% CI [-0.43, 0.21], and quality of life, $\Delta = 0.42$, $p = .75$, $d = 0.06$, 95% CI [-0.28, 0.39]).

3.3.3. Sensitivity analysis

The results of the sensitivity analysis are summarized in Table S1. PTSD severity as measured with the PDS indicated that the conclusions made under the MAR assumption are robust even after increasing the individual imputed scores, that is, the total score as well as the subscale score showed meaningful within-group changes throughout the intervention and no statistically significant between-group differences. The same

applied for most of the secondary outcomes, although some of the within-group improvements became non-significant in more extreme conditions (increase of the individual scores by 75%). However, all between-group differences remained statistically insignificant.

4. Discussion

The aim of the present study was to shed more light on a brief and scalable IBI for (post)conflict-affected and socially restricted regions. PTSD symptom change and dropout rate for the protocol with only one cognitive module (TF-short) were compared to those for a more complex longer intervention with an additional cognitive restructuring component (TF-reg).

The results showed no significant differences in PTSD symptom change between the treatment conditions (TF-reg vs. TF-short) or for the symptom change in all secondary outcomes. Large within-group effect sizes suggest the efficacy of both interventions in reducing PTSD symptoms. The overall effect sizes for both interventions ($d_{\text{PDS-TF-reg}} = -1.08$; $d_{\text{PDS-TF-short}} = -1.13$) are comparable with the effect size reported in a previous study which evaluated the longer intervention (Knaevelsrud et al., 2015). The large within-group effect sizes are also comparable to those from other internet-based (Gaebel et al., 2017) as well as face-to-face (Watkins, Sprang, & Rothbaum, 2018) studies for PTSD. The results provide evidence that a TF-short intervention with only one cognitive technique seems to be sufficient to effectively reduce PTSD symptoms. This finding can be explained by the fact that the TF-short protocol also includes the state-of-the-art cognitive and behavioural techniques (Lewis et al., 2020). A look at the literature also reveals that the TF-short intervention is one of the shortest Internet-based PTSD interventions, since previously investigated interventions range from 6–18 sessions (Young & Campbell, 2018). Based on the current data, no definitive conclusions can be drawn about the optimal length of Internet-based PTSD treatments (Lewis et al., 2019).

With regard to the non-starter attrition rates, no differences were found between the two interventions: In both interventions, a comparable number of participants did not start the treatment (19.3% TF-reg and 24.5% TF-short, non-significant difference). This is in line with previous findings regarding time courses of attrition rates in PTSD treatments, according to which there is a high risk of attrition prior to attending the first session (Gutner, Gallagher, Baker, Sloan, & Resick, 2016; Kehle-Forbes, Meis, Spont, & Polusny, 2016) and also corresponds to pre-treatment attrition rates reported in IBI studies (24.2%, Fernandez et al., 2015, i-CBT: 18.6% and 15.2%, Simon et al., 2019). Contrary to our hypothesis, the dropout rates during treatment (25.3% TF-reg; 17.4% TF-short) did not differ significantly. Both rates are comparable with

the rates reported for PTSD treatments (i-CBT: meta-analysis 25%, Lewis et al., 2019; systematic review 8.69–62.5%, Simon et al., 2019). The literature shows that trauma-focused therapies in particular have a greater dropout compared to non-trauma-focused interventions (Lewis, Roberts, Gibson, & Bisson, 2020). This may provide an explanation for the comparable level of dropout rates in this study, as it is possibly not the length of the intervention (6 vs. 10 sessions) that is relevant for the dropout but rather the treatment components (i.e. exposure). To date, research on predictors of dropout is inconsistent, suggesting a complex interaction between different variables (e.g. sociodemographic, psychological, design-related variables, Lewis et al., 2020; Swift & Greenberg, 2012). A dropout analysis, which includes parts of the therapies presented here, underlines this inconsistency as only three of 25 variables tested could be identified as significant predictors for dropout (marital status, treatment credibility, and the participants' year of treatment registration, Vöhringer et al., 2020). Type of trauma and symptom severity were not predictive for dropout (Vöhringer et al., 2020). Future research needs to take into account the interplay of additional variables that are specifically related both to the sociocultural context and to the components of the intervention.

In general, IBIs help to overcome some treatment barriers regarding fear of stigma and the general availability of psychotherapeutic offers in politically unstable and (socially) restricted societies. In particular, the present findings indicate that a brief intervention with exposure and one cognitive techniques (TF-short) results in a significant PTSD symptom change, which is comparable to the symptom change from an efficacious longer more complex version (TF-reg). Thus, the brief intervention represents a scalable approach which allows more people to be treated during the same period of time, leading to a higher cost-effectiveness compared to the longer intervention. In addition, the current study shows that both interventions seem to be suitable for a particularly vulnerable group. Participants reported an average of 5.14 different traumatic events and many reported sexual abuse as an index trauma. Both the type of trauma (i.e. interpersonal trauma) and the number of different traumatic events have an impact on symptom severity and treatment outcome (Priebe et al., 2018). This is particularly important to consider for clinical practice. The assumption that a shorter intervention would decrease the dropout rate was not confirmed in this study, suggesting that dropout might be related more to the therapeutic components than to the length of the intervention. Nevertheless, it is likely that the short version better addresses the living conditions in the MENA region, which are often characterized by personal and societal ruptures that lead to restrictions and endangerments (e.g. for women, victims of sexual

violence). Such circumstances allow for only short periods of privacy, security and stability. Especially in the current COVID pandemic, the availability of an effective short internet-based intervention for PTSD is an important clinical implication. Due to the experience of traumatic events during the pandemic (e.g. own severe COVID illness, loss of loved ones, direct work with COVID patients), an increase in PTSD prevalence worldwide can be expected. The pandemic has also severely limited physical contact which changed the type of communication in psychosocial and psychotherapeutic contexts, so that internet-based services are currently playing a prominent role in care and will continue to do so in the future.

Several limitations of the present study have to be considered when interpreting the results. The first limitation pertains to the lack of an inactive control group, meaning that it was not possible to exclude natural temporal trends or other unmeasured events as potential explanations for significant improvements in the two conditions. Nevertheless, multiple studies have indicated that there is little change in symptoms without any active treatment (Mavranouzouli et al., 2020). Moreover, within-group effect sizes in this study are comparable to those reported in the randomized controlled trial with a waitlist control group (Knaevelsrud et al., 2015). Second, the treatments were not synchronized in terms of content, i.e. the interventions did not contain the same therapeutic components in the first six assignments. Therefore, the findings might be attributable to differences in temporal dosage. Third, PTSD, anxiety, depression, somatization and quality of life were assessed online via self-report. However, a clinical interview with trained experts was conducted before randomization in order to underpin the self-report of the PTSD symptoms. Fourth, no fidelity ratings were conducted. Thus, no statements can be made about whether the respective treatment condition is comparable in terms of content. However, large parts of the treatment manual were standardized and the continuous training was intended to ensure treatment fidelity. Fifth, no power analysis was calculated for the sample size estimation before recruitment started. The project was funded over the study period, accordingly participants could be recruited during this period.

Sixth, the generalizability of the results is limited. The participants are predominantly young, female and well-educated. However, these characteristics are frequently found in other internet-based and face-to-face studies (Lewis et al., 2020, 2019). Furthermore, the PTSD symptoms were assessed according to DSM-IV, as this was the current classification system at the time of the study. The study also has a high dropout rate, which, although comparable to other studies, could influence the results

and thus generalized conclusions (Lewis et al., 2019; Simon et al., 2019). Finally, as only a pre-post comparison was analysed, we are unable to draw any conclusions about the long-term effects of the two treatments.

In sum, these results suggest that there are no differences regarding PTSD symptom change between a short Internet-based CBT and an existing longer version. In light of the above-mentioned barriers and challenges to the use of psychotherapeutic interventions in Arabic-speaking countries in the MENA region, these results seem to be promising, as they allow, first of all, CBT to be offered and scaled up (due to geographical independence and short duration) in (post-)conflict-affected and socially restricted regions. In addition, the shorter intervention is in line with the recommendations of the WHO aiming to reduce the treatment gap for mental disorders in low- and middle-income countries (Dua et al., 2011). Simplifying interventions as well as using delivery channels to achieve a greater reach and equity are key aspects for scaling up interventions. Finally, future research should address the above-mentioned limitations and extend the focus with regard to cost-effectiveness and predictors of dropout and outcome by explicitly taking into account the specific sociocultural treatment context.

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Data availability statement

The data that support the findings of this study are available from the corresponding author, MB, upon reasonable request. The data are not publicly available due to their containing information that could compromise the privacy of research participants.

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