

Norton Transdiagnostic Group Cognitive Behavioural Therapy for Anxiety Disorders in an Iranian Clinical Context Using a Multiple Baseline Single-Case Design

Fatemeh Akhavan-Abiri

Shahed University

Mohammad Reza Shaeiri

shairigm@gmail.com

Shahed University

Hojjatollah Farahani

Tarbiat Modares University

Arsia Taghva

AJA University of Medical Sciences

Research Article

Keywords: anxiety disorders, transdiagnostic cognitive-behavioral therapy, single-case experimental design, limited efficacy, visual analysis

Posted Date: August 13th, 2026

DOI: <https://doi.org/10.21203/rs.3.rs-10521837/v1>

License: © ⓘ This work is licensed under a Creative Commons Attribution 4.0 International License.

[Read Full License](#)

Additional Declarations: No competing interests reported.

Norton Transdiagnostic Group Cognitive Behavioural Therapy for Anxiety Disorders in an Iranian Clinical Context Using a Multiple Baseline Single-Case Design

Fatemeh Akhavan-Abiri¹, Mohammad Reza Shaeiri^{2*}, Hojjatollah Farahani³, Arsia Taghva⁴

¹. Ph.D. Graduate of Clinical Psychology, Department of Psychology, Faculty of Humanities, Shahed University, Tehran, Iran.

^{2*}. Corresponding Author; Associate Professor, Department of Psychology, Faculty of Humanities, Shahed University, Tehran, Iran. (shairigm@gmail.com)

³. Associate Professor, Department of Psychology, Faculty of Humanities, Tarbiat Modares University, Tehran, Iran.

⁴. Professor, Department of Psychiatry, AJA University of Medical Sciences, Tehran, Iran.

Abstract

Aim: Anxiety disorders are characterized by high rates of comorbidity and substantial overlap in symptoms and diagnostic criteria, prompting the development of transdiagnostic cognitive-behavioral interventions. As part of a sequential feasibility program evaluating Norton Transdiagnostic Group Cognitive-Behavioral Therapy (TGCBT) in an Iranian clinical context, the present study examined its preliminary efficacy using a single-case experimental design.

Methods: A concurrent multiple-baseline single-case experimental design was conducted with two adults diagnosed with anxiety disorders who were recruited from mental health centers in Tehran, Iran, 2024. Participants completed three baseline assessments, two mid-treatment assessments, one post-treatment assessment, and two follow-up assessments using the SCID-5, FSAQ, GAD-7, FSS-III, PDSS-SR, and BDI-II. Treatment effects were evaluated through visual analysis, descriptive overlap measures (PND and POD), quantitative nonoverlap indices (Tau-U, PEM, NAP, and IRD), and clinical significance indices (RCI and MBLR).

Results: Visual analysis demonstrated moderate-to-large improvements across most outcome measures during treatment. Quantitative nonoverlap indices generally supported these findings, indicating moderate-to-large intervention effects during the baseline-to-treatment transition, whereas treatment-to-follow-up comparisons showed greater variability, reflecting differences in maintenance across symptom domains. Clinical significance analyses indicated reliable and clinically meaningful improvement for most outcome measures from baseline to post-treatment and follow-up.

Conclusion: These findings provide preliminary support for the efficacy of Norton's TGCBT in an Iranian clinical context and suggest that transdiagnostic treatment principles may be applicable across cultural settings. The results also support further evaluation of the protocol in adequately powered randomized controlled group-based trials.

Trial registration: This study was registered in the Iranian Registry of Clinical Trials (IRCT) under the registration number IRCT20240310061240N1 on 29 April 2024.

¹ . <https://orcid.org/0000-0002-1719-3676>

² . <https://orcid.org/0000-0002-2037-3475>

³ . <https://orcid.org/0000-0002-9799-7008>

⁴ . <https://orcid.org/0000-0001-8415-4581>

Keywords: anxiety disorders; transdiagnostic cognitive-behavioral therapy; single-case experimental design; limited efficacy; visual analysis.

Introduction

Anxiety disorders are defined by a pattern of excessive fear and anxiety, associated with behavioral disturbances [1]. When excessive in intensity, duration, or persistence relative to developmental expectations, these symptoms are distinguished from normative fear and anxiety based on clinical judgment within the individual's cultural and contextual background [1]. Anxiety disorders are among the most prevalent classes of mental disorders worldwide, with lifetime prevalence estimates approaching one in five individuals [2, 3]. Their typical early onset and chronic course suggest that spontaneous remission is relatively uncommon [4]. These disorders are also associated with substantial functional impairment, reduced quality of life, and increased healthcare utilization, highlighting their considerable public health burden [5]. Anxiety disorders differ from each other in the type of object or situation that provokes fear, anxiety, or behavioral avoidance, and the associated cognitions [6]. However, there is a high tendency for comorbidity between different diagnostic labels within the anxiety disorder category [1].

The differences between anxiety diagnoses derived from differences in the specific stimuli, eliciting strategies used to escape or avoid those stimuli, suggest that the initiating and sustaining factors are common across diagnoses [7]. Accordingly, increasing attention has shifted from disorder-specific symptom profiles toward identifying shared psychological processes that maintain emotional disorders across traditional diagnostic boundaries. Allen et al. [8] argued that anxiety disorders may be more similar than different. In line with this view, Norton [7] further argued that differentiating among anxiety diagnoses is often clinically challenging. Furthermore, the type of diagnosis of anxiety disorders does not make a fundamental difference in the treatment framework [7]. These conceptual developments helped provide the theoretical foundation for transdiagnostic interventions that target shared maintaining mechanisms rather than diagnosis-specific symptom presentations.

Although diagnosis-specific protocols of Cognitive Behavior Therapy (CBT) have consistently demonstrated efficacy for individual anxiety disorders, substantial overlap in symptoms, diagnostic criteria, and underlying maintaining processes has challenged the exclusive reliance on disorder-specific treatment models [2, 9]. Consequently, transdiagnostic interventions were developed to address these shared mechanisms using unified treatment principles that could be applied across multiple anxiety disorders rather than being tailored to a single diagnosis [9].

Although there is no single universally accepted definition of the transdiagnostic approach, these interventions broadly aim to treat multiple co-occurring disorders by targeting common psychological processes rather than diagnosis-specific symptoms. In other words, they "use the same underlying treatment principles without tailoring the treatment protocol to specific diagnoses" *p. 21* [10]. Accordingly, transdiagnostic interventions are designed to be applicable across a broad range of clinical presentations without requiring diagnosis-specific modifications [11].

The Transdiagnostic Group Cognitive Behavioral Therapy (TGCBT) for anxiety disorders, developed by Peter J. Norton, is one of the most extensively investigated transdiagnostic group interventions for anxiety disorders [12, 13]. The protocol consists of twelve sessions, each lasting approximately two hours, and is typically delivered to groups of six to eight participants by one or two trained therapists [7]. Numerous clinical investigations have demonstrated the effectiveness of the Norton TGCBT across diagnostically heterogeneous anxiety samples, including individuals with diagnoses of Generalized Anxiety

Disorder (GAD), Social Anxiety Disorder (SAD), PD, agoraphobia, and specific phobia [14-24]. Although originally developed as a group protocol, the treatment manual also indicates that its therapeutic procedures may be delivered in an individual format when clinically or methodologically appropriate [7]. The protocol's standardized manual, established evidence base, and applicability to diagnostically heterogeneous anxiety presentations make it well suited for evaluating its implementation in new cultural settings [12, 13].

Therapeutically, TGCBT incorporates CBT components, such as psychoeducation, cognitive restructuring, exposure exercises, and relapse prevention strategies. Rather than introducing disorder-specific techniques, the protocol integrates established CBT components into a unified framework that targets psychological mechanisms shared across anxiety disorders. Initial evaluations demonstrated that, beyond improving primary anxiety diagnoses, TGCBT was also associated with significant reductions in comorbid anxiety conditions and secondary depressive symptoms. Importantly, treatment response did not differ significantly as a function of specific anxiety diagnoses, consistent with the transdiagnostic premise that common therapeutic processes may benefit diverse anxiety presentations [15, 17, 18, 20-22].

To our knowledge, only one published report has examined the implementation of Norton TGCBT using a group-based single-case design [25]. The study provided a preliminary visual analysis of repeated outcome measurements obtained from two participants within a six-member therapy group. One participant met diagnostic criteria for PD with agoraphobia and the other for SAD. Across treatment, both participants demonstrated reductions in state anxiety as measured by the State Anxiety Inventory (STAI).

Extensive literature indicates that the implementation of Norton TGCBT has expanded globally, moving from initial efficacy trials [21] to sophisticated evaluations of mechanisms of action, mediating variables [26-30], and process dynamics like therapeutic alliance [31]. However, this empirical progression has predominantly occurred within Western cultural contexts. Collectively, these studies demonstrate that the protocol has evolved beyond efficacy testing toward understanding the therapeutic processes through which change occurs. Consequently, considerably less is known about how the protocol performs during its initial implementation in culturally distinct healthcare systems before large-scale effectiveness trials become feasible. Addressing this gap is particularly important because establishing the initial clinical performance of a standardized transdiagnostic group intervention represents a critical step before investing in larger effectiveness or implementation trials within a new healthcare system.

Given that the implementation of Norton TGCBT in Iran represented the first application of this protocol within this cultural and clinical context, a staged feasibility program was undertaken before evaluating preliminary clinical outcomes. Feasibility studies are small-scale preliminary investigations designed to determine whether an intervention can be implemented successfully before proceeding to larger-scale evaluations, such as randomized controlled trials (RCTs) [32]. Such studies are particularly recommended when an intervention is introduced by a new research team or implemented for the first time within a different target population or cultural setting [33]. Consistent with this methodological framework, the present research team previously evaluated the acceptability and procedural feasibility of implementing Norton TGCBT in an Iranian clinical sample using feasibility questionnaires completed by patients, the treating therapist, and an expert panel. That study established the protocol's feasibility but did not evaluate or report clinical outcome data [34].

Having established the acceptability and procedural feasibility of implementing TGCBT, the next methodological step was to obtain preliminary evidence regarding whether the intervention also produced measurable clinical improvement before undertaking larger-scale controlled evaluations. Accordingly, the present study addresses the "limited efficacy" domain of feasibility research as described by Bowen et al.

[33], focusing on whether the intervention demonstrates preliminary clinical benefit under real implementation conditions. Unlike our previous feasibility report, which focused exclusively on implementation-related outcomes, the present study examines repeated clinical outcome measures to determine whether TGCBT demonstrates preliminary therapeutic benefit within the same implementation program. Specifically, the primary objective was to evaluate the preliminary clinical efficacy of Norton TGCBT in reducing symptom severity among individuals diagnosed with GAD, SAD, PD, and agoraphobia. Using a concurrent multiple-baseline single-case design, the present study provides a fine-grained longitudinal assessment of symptom change during the initial implementation of Norton protocol in an Iranian clinical context. To maximize experimental control during this preliminary stage of cultural implementation, the protocol was evaluated in an individual treatment format before subsequent evaluation in its intended group format.

Method

Design

To evaluate the limited efficacy of Norton's TGCBT following the establishment of its acceptability and procedural feasibility, the present study employed a concurrent multiple-baseline single-case experimental design across participants. Single-case experimental designs (SCEDs) provide a rigorous methodology for preliminary evaluation of clinical interventions, particularly when an established treatment protocol is being implemented within a new cultural context [35, 36]. This design is particularly appropriate for obtaining preliminary evidence of clinical benefit following the establishment of implementation feasibility, before proceeding to larger controlled evaluations.

A concurrent multiple-baseline design was selected because it enables systematic replication across participants while allowing each participant to serve as their own historical control. By staggering the introduction of treatment across participants, the design controls for common threats to internal validity, including history, maturation, and repeated testing, thereby strengthening causal inferences regarding the relationship between the intervention and observed symptom change [36].

Participants

Participants were selected via purposive sampling [37] from a pool of individuals seeking psychological services at the counseling centers of Iran University of Medical Sciences and Shahid Beheshti University in Tehran, Iran, 2024, as well as through community-based digital recruitment. Purposive sampling was used to recruit individuals meeting the predefined clinical characteristics required for the evaluation of the intervention [35]. The target population comprised adults aged 18–45 years presenting with one or more of the targeted anxiety disorders. Potential participants underwent psychiatric evaluation followed by diagnostic confirmation using the Structured Clinical Interview for DSM-5 Disorders (SCID-5).

To be eligible for inclusion, participants were required to meet the following criteria: (a) aged between 18 and 45 years and fluent in Persian; (b) met the formal diagnostic criteria for at least one primary anxiety disorder—specifically Generalized Anxiety Disorder (GAD), Social Anxiety Disorder (SAD), Panic Disorder (PD), or Agoraphobia—as confirmed by the SCID-5; (c) demonstrated either complete absence of psychiatric medication during the past 12 months or a stable, unchanged medication regimen for at least three months prior to the baseline, with a commitment to maintaining this stability throughout the study; (d) exhibited an absence of active suicidal ideation, psychosis, or severe cognitive impairment; and (e) agreed to abstain from any concurrent psychotherapy during the protocol execution.

Exclusion criteria during the trial were defined as: (a) the onset of an acute psychiatric crisis (e.g., active suicidality or manic episode) requiring immediate crisis intervention, or (b) initiation of any new psychotropic medication. Because SCEDs rely on continuous repeated measurements, participant adherence to both treatment attendance and outcome assessment was considered essential for preserving the integrity of the multiple-baseline design. Accordingly, missing more than two consecutive treatment sessions, or repeatedly failing to complete the session-by-session assessments, resulted in formal withdrawal from the study.

Following diagnostic assessment and provision of written informed consent, two participants (one female and one male) who met all eligibility criteria were enrolled in the concurrent multiple-baseline study. Participants' demographic and clinical characteristics are presented in Table 1.

Table 1. Demographic and clinical characteristics of the participants

ID	age (year)	sex	marital status	children (n)	education level	occupation	diagnoses		medication use	
							primary	comorbid	previous	current
1	38	Female	married	2	associate degree	homemaker	PD	Agoraphobia GAD	✓	✗
2	31	male	single	—	bachelor's degree	medical equipment salesperson	GAD	PD	✗	✗

Measures

Outcome measures were selected to capture both transdiagnostic and disorder-specific symptom change across the heterogeneous anxiety presentations included in the study. Accordingly, a structured diagnostic interview (SCID-5) was used to establish eligibility, whereas standardized self-report measures were selected to assess overall anxiety, diagnosis-specific symptom severity, and depressive symptoms throughout the intervention.

Structured Clinical Interview for DSM-5 Disorders (SCID-5)

Structured Clinical Interview for DSM-5 Disorders (SCID-5) is a semi-structured interview designed for establishing DSM-5 psychiatric diagnoses [38]. The SCID-5 has demonstrated good diagnostic reliability and validity in international studies. Shankman et al. [39] reported excellent internal consistency across diagnostic categories ($\alpha = .87$ to $.98$) and acceptable sensitivity ($.38$ to $.92$). Similarly, Osório et al. [40] reported high diagnostic agreement between clinical interview and SCID-5 diagnoses (73%–97%), with kappa coefficients, sensitivity, and specificity generally exceeding $.70$ across disorders. In Iranian samples, the SCID-5 has also demonstrated satisfactory psychometric properties. Mohammadkhani et al. [41] reported strong internal consistency ($\alpha = .95$ – $.99$), test–retest reliability ($.60$ – $.79$), and kappa coefficients ranging from $.57$ to $.72$ for the research version (SCID-5-RV). Shabani et al. [42] evaluated the clinical version (SCID-5-CV) and reported kappa coefficients ranging from $.34$ to $.90$, sensitivity from $.82$ to $.94$, and specificity from $.78$ to $.98$. In the present study, the Persian version of the SCID-5, validated by Shabani et al. [42], was used to establish participants' eligibility and confirm primary anxiety disorder diagnoses and rule out exclusionary psychiatric conditions.

Four System Anxiety Questionnaire (FSAQ)

Four System Anxiety Questionnaire (FSAQ) is a self-report measure developed by Koksai and Power [43] to assess the physical, cognitive, behavioral, and emotional components of anxiety. The questionnaire consists of 60 items, scored according to a weighted scoring system that yields four component scores and an overall anxiety score [43-45]. Koksai and Power [43] reported satisfactory psychometric properties for the original version, including split-half reliability coefficients ranging from .68 to .82 for the subscales and .92 for the total score. Criterion validity was supported by significant differences between anxious patients and non-clinical controls ($F(1, 270) = 171.98, p < .001$). In Iranian samples, Maredpour et al. [45] reported acceptable internal consistency, with Cronbach's alpha coefficients ranging from .64 to .78 for the subscales and .89 for the total score. The Persian version of the FSAQ validated by Maredpour et al. [45] was used to assess transdiagnostic anxiety symptoms across repeated measurements throughout the study.

Panic Disorder Severity Scale – Self-Report version (PDSS-SR)

Panic Disorder Severity Scale–Self-Report (PDSS-SR) is a seven-item self-report measure developed by Houck et al. [46] to assess the severity of panic disorder symptoms, based on the clinician-rated PDSS developed by Shear et al. [47]. The PDSS-SR consists of seven items; each rated on a 5-point Likert scale ranging from 0 to 4. Total scores are obtained by summing item responses, with higher scores indicating greater panic symptom severity. Roberge et al. [48] supported a unidimensional factor structure and reported good internal consistency ($\alpha = .91$) and adequate convergent validity with clinician-rated panic and related anxiety measures in a French sample. Akhavan-Abiri et al. [49] reported a cutoff score of 6.50 together with satisfactory psychometric properties for the Persian version. In the present study, the Persian version of the PDSS-SR was used to assess the severity of panic disorder symptoms in participants with PD.

7-item Generalized Anxiety Disorder (GAD-7) Scale

7-item Generalized Anxiety Disorder Scale (GAD-7) is a seven-item self-report measure developed by Spitzer et al. [50] to assess the severity of generalized anxiety disorder symptoms. The scale consists of seven items; each rated from 0 (never) to 3 (almost every day). Spitzer et al. [50] reported good internal consistency ($\alpha = .92$) and satisfactory test–retest reliability ($r = .83$). Convergent validity was supported through moderate to strong correlations with the SF-20 anxiety subscale ($r = .39-.91$), the Beck Anxiety Inventory ($r = .72$), and the anxiety subscale of the SCL-90-R ($r = .70$). Na’inian et al. [51] reported acceptable psychometric properties for the Persian version of the GAD-7. Internal consistency was adequate ($\alpha = .85$), while test–retest reliability was .48 ($p < .010$). Evidence for convergent validity was demonstrated through significant correlations with the State–Trait Anxiety Inventory (state: $r = .71$; trait: $r = .52$) and the anxiety subscale of the SCL-90-R ($r = .63, p < .001$), supporting the validity of the instrument in Iranian populations. In the present study, the Persian version of the GAD-7 validated by Na’inian et al. [51] was used to assess the severity of generalized anxiety symptoms in participants with GAD.

Third version of the Fear Survey Schedule (FSS-III)

Third version of the Fear Survey Schedule (FSS-III) is a self-report measure developed by Wolpe and Lang [52] to assess the severity of fears across a broad range of situations and stimuli. The questionnaire consists of 89 items rated on a 5-point Likert scale, with higher scores indicating greater fear severity. The original instrument demonstrated excellent internal consistency ($\alpha = .95$) [53]. Bakhshi-Pour et al. [54] reported satisfactory psychometric properties for the Persian version, including high internal consistency ($\alpha = .95$) and test–retest reliability over a one-week interval ($r = .94$). In addition, exploratory and confirmatory factor analyses supported a six-factor structure, with the six-factor model demonstrating the best fit to the data. In

the present study, the Persian version of the FSS-III validated by Bakhshi-Pour et al. [54] was used to assess fear-related symptoms, including agoraphobic and social fears.

Beck Depression Inventory – Second Edition (BDI-II)

Beck Depression Inventory–Second Edition (BDI-II) is a 21-item self-report measure developed by Beck et al. [55] to assess the severity of depressive symptoms. Each item is scored from 0 to 3, with higher total scores indicating greater depressive symptom severity. The BDI-II has demonstrated strong psychometric properties across diverse populations. Beck et al. [55] reported high internal consistency ($\alpha = .73-.92$, mean = .86), with slightly higher reliability in clinical than non-clinical samples. In Iranian samples, Ghassemzadeh et al. [56] reported good convergent validity, with significant correlations between the BDI-II and the Automatic Thoughts Questionnaire (ATQ; $r = .77$). Factor-analytic findings supported a three-factor structure that demonstrated better fit than alternative one- and two-factor models, providing evidence for the construct validity of the Persian version. In the present study, the Persian version of the BDI-II validated by Ghassemzadeh et al. [56] was used to assess the severity of comorbid depressive symptoms.

Intervention

Transdiagnostic Cognitive-Behavioral Group Therapy (TGCBT) for anxiety disorders

Transdiagnostic Group Cognitive-Behavioral Therapy (TGCBT) was implemented using the standardized 12-session treatment manual developed by Norton [7]. The protocol was originally designed for the treatment of diagnostically heterogeneous anxiety disorders within a group format and was delivered in weekly sessions lasting approximately two hours.

The intervention integrates core cognitive-behavioral techniques—including psychoeducation, cognitive restructuring, graduated exposure, and relapse prevention—within a transdiagnostic framework targeting psychological processes shared across anxiety disorders. Across treatment, participants progressed from understanding the cognitive-behavioral model of anxiety to identifying maladaptive beliefs, engaging in individualized exposure exercises, and developing relapse-prevention strategies consistent with the treatment manual [7].

All treatment sessions were conducted by the first author, a licensed clinical psychologist who had received formal training in Norton TGCBT protocol and adhered to the published treatment manual throughout the intervention.

Because the first author also conducted the diagnostic assessments and outcome evaluations, all assessments were administered using standardized procedures to minimize potential assessment bias.

Procedure

Following approval of the study by the Ethics Committee of Shahed University (Approval Code: IR.SHAHED.REC.1402.126), the study was conducted according to a prespecified research protocol. Prior to participant recruitment, the original therapist manual of Norton Transdiagnostic Group Cognitive-Behavioral Therapy (TGCBT) was obtained through correspondence with the treatment developer and translated into Persian by the first author for clinical implementation. The translated manual was subsequently reviewed for conceptual and clinical accuracy by the second author to ensure conceptual equivalence with the original treatment manual prior to implementation.

Participants were recruited 2024 through counseling centers affiliated with Shahid Beheshti University and Iran University of Medical Sciences, advertisements distributed across several universities and mental

health centers in Tehran, and online announcements via social media platforms. Interested individuals underwent an initial eligibility screening before psychiatric and diagnostic evaluation.

Potential participants underwent an initial psychiatric evaluation by a consulting psychiatrist, followed by diagnostic assessment using the Persian version of the SCID-5 conducted by the first author, a licensed clinical psychologist trained in structured diagnostic interviewing. The psychiatrist confirmed participants' clinical eligibility prior to enrollment. Individuals meeting all inclusion criteria and providing written informed consent entered the study. Consistent with the concurrent multiple-baseline design, three repeated baseline assessments were completed before treatment initiation using the FSAQ, GAD-7, FSS-III, PDSS-SR, and BDI-II.

Although the protocol was delivered individually, all therapeutic procedures, session sequence, intervention components, or core intervention components were implemented according to Norton's published treatment manual with no modification. The protocol was delivered individually to permit repeated within-participant evaluation consistent with the methodological requirements of the concurrent multiple-baseline design. Outcome measures were re-administered following Sessions 4 and 8 to monitor symptom change during treatment. These repeated assessments allowed characterization of symptom trajectories across the treatment phase, consistent with the methodological requirements of the concurrent multiple-baseline design. A post-treatment assessment was conducted immediately following Session 12. Follow-up assessments were subsequently completed 4 and 8 weeks after treatment termination. The two follow-up assessments were planned to evaluate the short-term maintenance of treatment gains after completion of the intervention.

The first author was responsible for participant recruitment, diagnostic assessment, administration of outcome measures, and delivery of the TGCBT protocol throughout the study. Because this study represented the limited-efficacy phase of a sequential feasibility program evaluating Norton's TGCBT in an Iranian clinical context, these roles were undertaken by the first author to ensure procedural consistency across recruitment, assessment, and intervention delivery. To enhance treatment fidelity and reduce the potential influence of therapist-related bias, the intervention was conducted under ongoing clinical supervision by the second author, who served as the project's clinical supervisor. Video recordings of treatment sessions were reviewed at three predefined time points (Sessions 3, 8, and 11), representing the early cognitive restructuring phase, the exposure phase, and the advanced cognitive restructuring/relapse prevention phase, respectively. These structured reviews were supplemented by supervisory meetings held approximately every two weeks throughout the intervention. Supervision focused on adherence to Norton's published treatment manual and accurate implementation of the intervention across the three major phases of the protocol. Supervisory feedback was incorporated into subsequent treatment sessions when appropriate.

The potential source of assessor expectancy bias was partially mitigated by the use of standardized self-report outcome measures completed independently by participants, repeated participant-completed outcome assessments across all study phases, and ongoing clinical supervision throughout the intervention. Together, these procedures were intended to enhance treatment fidelity while preserving standardized implementation of Norton's protocol throughout the study.

All diagnostic assessments, treatment sessions, and outcome assessments were conducted at the Velenjak and Keshavarz Boulevard branches of the Shahid Beheshti University Counseling Center, Tehran, Iran.

Statistical Analysis

Visual analysis constituted the primary method for evaluating treatment effects, consistent with established methodological recommendations for single-case experimental designs (SCEDs), in which systematic visual inspection remains the cornerstone for determining whether observed changes are functionally related to the introduction of an intervention [36, 57]. Accordingly, conclusions regarding treatment efficacy were based on the convergence of evidence obtained from visual analysis, quantitative nonoverlap indices, and clinical significance measures rather than on any single analytical method.

Visual analysis was performed at both within-phase and between-phase levels. Within-phase analysis examined three fundamental characteristics of each study phase: level, reflecting the magnitude of observed scores; trend, indicating the direction and rate of change over time; and stability, referring to the consistency of observations within a phase. Between-phase analysis evaluated treatment-related changes by examining qualitative transitions in trend, relative and absolute changes in level, changes in median and mean scores, and the extent of overlap between adjacent phases. These dimensions represent the principal components of systematic visual analysis recommended for SCED methodology [57, 58].

Because visual inspection alone may be susceptible to subjective judgment, several complementary quantitative indices were calculated to strengthen interpretation of treatment effects. Four quantitative nonoverlap indices—Tau-U [59], Nonoverlap of All Pairs (NAP) [60], Percentage Exceeding the Median (PEM) [61], and Improvement Rate Difference (IRD) [62]—were selected because each quantifies intervention effects from a different methodological perspective, and no single index has been recommended as universally superior across all SCED applications [36, 59]. In addition, the Percentage of Nonoverlapping Data (PND) and the Percentage of Overlapping Data (POD) [57] were calculated as descriptive indicators of data overlap to facilitate comparison with previous SCED studies. For Tau-U, NAP, and PEM, interpretation followed the recommendations provided in the original methodological publications [59-62].

Clinical significance was evaluated using the Reliable Change Index (RCI) [63] and Mean Baseline Reduction (MBLR) [64]. The RCI was calculated to determine whether observed changes exceeded measurement error, with absolute values greater than 1.96 indicating statistically reliable change at the 95% confidence level [63, 65]. MBLR was calculated to quantify the percentage reduction in symptom severity relative to baseline. Consistent with previous applications of this approach, MBLR values exceeding 50% were considered indicative of clinically meaningful improvement [66]. Both RCI and MBLR were calculated relative to baseline to determine whether treatment-related improvements represented reliable and clinically meaningful change from participants' initial clinical status rather than merely reflecting fluctuations between adjacent assessment phases.

Finally, treatment effects were interpreted by integrating evidence across visual analysis, quantitative nonoverlap indices, and clinical significance measures. Consistent conclusions across these complementary approaches were considered to provide stronger evidence for intervention effects than reliance on any single visual or statistical indicator alone [36].

Tau-U, NAP, PEM, and IRD were calculated using the Single Case Research web-based calculator [67], whereas PND, POD, MBLR, and RCI, together with the visual analysis indices, were calculated manually.

Results

1. Descriptive Findings

Both participants completed all scheduled assessments across the baseline, treatment, post-treatment, and follow-up phases. No participant withdrew from the study or met any discontinuation criteria during the intervention. Raw scores for all outcome measures across assessment points are presented in Table 2.

Table 2. Outcome measure scores across baseline, treatment, post-treatment, and follow-up assessments

Single cases	Assessment Order		Assessment tools of outcome variables								
			PD (PDSS-SR)	GAD (GAD-7)	Agoraphobia (FSS-III)	Anxiety Symptoms (FSAQ)				Depression (BDI-II)	
						Feeling	Cognitive	Behavioral	Somatic	Total Score	
Case 1	Baseline	Step 1	12	7	18	78.20	76.90	44.60	43	242.70	17
		Step 2	13	7	15	69.60	72.90	34.70	46.10	223.30	18
		Step 3	12	10	14	78.20	81.40	33.60	50.90	244.10	18
	Treatment	Step 1	13	14	13	58.30	82.40	47.90	46.10	234.70	18
		Step 2	8	4	8	40.30	56.20	14.20	44.70	155.40	2
	Post-treatment		6	5	4	17.60	20.20	8.10	37.90	83.80	3
	Follow-up	Step 1	7	4	8	15.70	35.10	7.90	37.90	96.60	4
		Step 2	12	5	1	14.90	37.30	17.70	39.40	109.30	3
Case 2	Baseline	Step 1	7	11	-	67.40	82.40	33.40	50.60	233.80	26
		Step 2	8	12	-	64.10	81.40	79.50	50	275	31
		Step 3	10	15	-	77.90	81.40	29.20	58.20	246.70	38
	Treatment	Step 1	5	8	-	71	81.40	39.80	48.40	240.60	21
		Step 2	5	4	-	41	60.60	6.40	17.60	125.60	20
	Post-treatment		2	1	-	8.10	13.90	6.40	4.20	32.60	4
	Follow-up	Step 1	1	0	-	17.80	8.10	13.90	1.40	41.20	11
		Step 2	0	5	-	49.20	60.60	13.40	18.90	142.10	19

2. Visual and Quantitative Analyses

Visual analysis was conducted in accordance with established guidelines for single-case experimental designs by examining within-condition and between-condition changes across study phases. Within-condition analysis evaluated level, stability, and trend within each phase. Between-condition analysis examined qualitative changes in trend and level, as well as quantitative indices of level change and data overlap, including Percentage of Nonoverlapping Data (PND), Percentage of Overlapping Data (POD), Tau-U, Percentage Exceeding the Median (PEM), Nonoverlap of All Pairs (NAP), and Improvement Rate Difference (IRD). Visual analysis findings are presented separately for each participant, followed by an integrated summary across both participants.

2.1. Participant 1

Table 3 presents the visual and quantitative within-condition and between-condition analyses of Participant 1 across all outcome measures. Within-condition analyses summarize changes in level, stability, and trend

within each study phase, whereas between-condition analyses evaluate qualitative trend transitions, level changes, and nonoverlap indices across adjacent phases.

Table 3. Within-condition and between-condition visual analysis of outcome measures for participant 1

Outcome variables		PD			Agoraphobia			GAD			Total anxiety symptoms			Depression			
Assessment order	Statistics	Baseline	Treatment	Follow-up	Baseline	Treatment	Follow-up	Baseline	Treatment	Follow-up	Baseline	Treatment	Follow-up	Baseline	Treatment	Follow-up	
Total scores ordered up-to-down		12	13	7	18	13	1	7	14	4	242.7	234.7	96.6	17	18	4	
		13	8	12	15	8	1	7	4	5	223.3	155.4	109.3	18	2	3	
		12	6		14	4		10	5		244.1	83.8		18	3		
Within-condition analysis	Median	12	8	9.5	15	8	1	7	5	4.5	242.7	155.4	102.95	18	3	3.5	
	Mean	12.33	9	9.5	15.67	8.33	1	8	7.67	4.5	236.7	157.97	102.95	17.67	7.67	3.5	
	Range	1	7	5	4	9	0	3	9	1	20.8	150.9	12.7	1	16	1	
	Stability envelope	9.6-14.4	6.4-9.6	3.5-10.5	12-18	6.4-9.6	0.8-1.2	5.6-8.4	4-6	3.6-5.4	194.16-291.24	124.32-186.48	82.36-123.54	14.4-21.6	2.4-3.6	2.8-4.2	
	Data percent in stability envelope	100%	33%	—	100%	33%	—	67%	67%	—	100%	33%	—	100%	33%	—	
	Level	Range of stability envelope	Stable	Variable	—	Stable	Variable	—	Variable	Variable	—	Stable	Variable	—	Stable	Variable	—
	Level change	Relative level change	0	-2.5	—	-2	-4.5	—	+1.5	-5.5	—	+0.7	-75.45	—	+0.5	-2.5	—
		Absolute level change	0	-7	—	-4	-9	—	+3	-9	—	+1.4	-150.9	—	+1	-15	—
	Stability	Stability orientation	flat	Decreasing	—	Decreasing	Decreasing	—	Increasing	Decreasing	—	Increasing	Decreasing	—	Increasing	Decreasing	—
		Data percent in stability envelope	100%	100%	—	100%	100%	—	100%	0.00%	—	100%	33%	—	100%	0.00%	—
Trend	Trend orientation	No change	Decreasing	Increasing*	Decreasing	Decreasing	No change*	Increasing	Decreasing	Increasing*	Increasing	Decreasing	Increasing*	Increasing	Decreasing	Decreasing*	
Between-condition analysis	Visual qualitative transition in trend																
		Negative	Variable	Negative	Negative	Variable	Variable	Variable	Variable	Variable	Variable	Variable	Variable	Variable	Variable	Negative	
	Level change	relative	+5.5	+1.25	+4	-4	-1.5	-0.5	+38.65	-19.82	-1.25	+8	+1.25				
		absolute	-1	+1	+1	-3	-4	-1	+9.4	+12.8	0	+1					
		median	+4	+1.5	+7	-7	+2	-0.5	+87.3	-52.45	+15	+0.5					
		mean	+3.33	+0.5	+7.34	-7.33	+0.33	-3.17	+78.73	-55.02	+10	-4.17					
	Data overlap	PND	67%	0%**	100%	100%**	67%	0%**	67%	0%**	67%	0%**	67%	0%**	67%	0%**	67%
		POD	33%	100%**	0%	0%**	33%	100%**	33%	100%**	33%	100%**	33%	100%**	33%	100%**	33%
		Tau U	-.44	0.00**	-.67	-1.00**	-.56	-.33**	+.78	-.33**	+.78	-.33**	+.78	-.33**	+.78	-.33**	+.78
	Nonoverlap indices	PEM	.67	.50**	1.00	1.00**	.67	.50**	1.00	.67	.50**	1.00	.67	.50**	1.00	.67	.50**
NAP		.28	.50**	0.00	0.00**	.33	.33**	.11	.33**	.11	.33**	.11	.33**	.11	.33**	.11	
IRD		.67	0.00**	1.00	1.00**	.67	0.00**	.67	0.00**	.67	0.00**	.67	0.00**	.67	0.00**	.67	

* Stability indices were not computed for the follow-up phase because only two observations were available. The direction of change (trend direction for baseline-treatment comparisons) during follow-up should therefore be interpreted descriptively.

** These nonoverlap indices are reported descriptively for treatment–follow-up comparisons because they were originally developed for baseline–intervention contrasts.

Visual analysis of Participant 1 presented in Table 3 indicated differential patterns of change across the outcome measures over the course of treatment and follow-up. Panic disorder symptoms decreased during the treatment phase but showed partial loss of treatment gains during follow-up, with scores approaching baseline levels by the final follow-up assessment. In contrast, generalized anxiety and agoraphobia demonstrated more consistent reductions during treatment that were generally maintained throughout follow-up. Total anxiety symptoms also declined markedly during treatment, although some attenuation of improvement was observed during follow-up. Depressive symptoms showed a substantial reduction during treatment and remained relatively stable across follow-up assessments. Overall, visual inspection together with the quantitative indices presented in Table 3 suggested more durable improvements for generalized anxiety, agoraphobia, and depressive symptoms than for panic disorder and total anxiety symptoms.

Consistent with these observations, the nonoverlap indices generally indicated moderate-to-large effects for the transition from baseline to treatment. In contrast, comparisons between the treatment and follow-up phases yielded more variable findings, with effect estimates ranging from small to large across the outcome measures, reflecting differences in the maintenance of treatment gains.

2.2. Participant 2

Table 4 presents the visual and quantitative within-condition and between-condition analyses of Participant 2 across all outcome measures. Within-condition analyses summarize changes in level, stability, and trend within each study phase, whereas between-condition analyses evaluate qualitative trend transitions, level changes, and nonoverlap indices across adjacent phases.

Table 4. Within-condition and between-condition visual analysis of outcome measures for Participant 2

Outcome variables		PD			GAD			Total anxiety symptoms			Depression		
Assessment order	Statistics	Baseline	Treatment	Follow-up	Baseline	Treatment	Follow-up	Baseline	Treatment	Follow-up	Baseline	Treatment	Follow-up
Within-condition analysis	Total scores ordered up-to-down	7	5	2	11	8	0	233.8	240.6	41.2	26	21	11
		8	5	1	12	4	5	275	125.6	142.1	31	20	19
		10	2		15	1		246.7	32.6		38	4	
	Median	8	5	1.5	12	4	2.5	246.7	125.6	91.65	31	20	15
	Mean	8.33	4	1.5	12.67	4.33	2.5	251.83	132.93	91.65	31.67	15	15
	Range	3	3	1	4	7	5	41.2	208	100.9	12	17	8
	Stability envelope	6.4-9.6	4-6	1.2-1.8	9.6-14.4	3.2-4.8	2-3	197.36-296.04	100.48-150.72	73.32-109.98	24.8-37.2	16-24	8.8-13.2
	Data percent in stability envelope	67%	67%	—	67%	33%	—	100%	33%	—	67%	67%	—
	Level												
	Range of stability envelope	Variable	Variable	—	Variable	Variable	—	Stable	Variable	—	Variable	Variable	—
	Level change												
	Relative level change	+1.5	-1.5	—	+2	-3.5	—	+6.45	-104	—	+6	-8.5	—
	Absolute level change	+3	-3	—	+4	-7	—	+12.9	-208	—	+12	-17	—
	Stability												
	Stability orientation	Increasing	Decreasing	—	—	Decreasing	—	—	Decreasing	—	—	Decreasing	—
	Data percent in stability envelope	100%	100%	—	—	100%	—	—	33%	—	—	100%	—
Between-condition analysis	Trend												
	Trend orientation	Increasing	Decreasing	Decreasing*	Increasing	Decreasing	Increasing*	Increasing	Decreasing	Increasing*	Increasing	Decreasing	Increasing*
	Visual qualitative transition in trend												
		Variable	Negative		Variable	Variable		Variable	Variable		Variable	Variable	Variable
	Level change	Relative	+4	-1.75	+7.5	-1.25		+77.75	-12.67		+14	+1	
		Absolute	+5	0	+7	-1		+6.1	+8.6		+17	+7	
		Median	+4	-3.5	+8	-1.5		+121.1	-33.95		+11	+9	
		Mean	+2.33	-2.5	+8.33	-1.83		+118.9	-41.28		+16.67	0	
	Data overlap	PND	100%	50%**	100%	50%**		67%	0%**		100%	0%**	
		POD	0%	50%**	0%	50%**		33%	100%**		0%	100%**	
		Tau U	-1	-.83**	-1	-.33**		-.78	0.00**		-1	-.33**	
	Nonoverlap indices	PEM	1.00	1.00**	1.00	.50**		1.00	.50**		1.00	1.00**	
		NAP	0.00	.08**	0.00	.33**		-.11	.50**		0.00	.33**	
		IRD	1.00	.50**	1.00	.50**		.67	0.00**		1.00	.67**	

* Stability indices were not computed for the follow-up phase because only two observations were available. The direction of change (trend direction for baseline-treatment comparisons) during follow-up should therefore be interpreted descriptively.

** These nonoverlap indices are reported descriptively for treatment–follow-up comparisons because they were originally developed for baseline–intervention contrasts.

Visual analysis of Participant 2 indicated improvements across all outcome measures during the treatment phase, although the degree of maintenance varied across outcomes. Panic disorder symptoms showed a consistent reduction during treatment that was largely maintained throughout follow-up. Generalized anxiety symptoms also decreased during treatment, with some increase observed at the second follow-up assessment while remaining below baseline levels. Total anxiety symptoms declined substantially during treatment but demonstrated partial loss of treatment gains at follow-up, particularly at the second follow-up assessment. Depressive symptoms likewise showed marked improvement during treatment, followed by some deterioration over follow-up, although symptom levels remained lower than those observed at baseline. Overall, visual inspection together with the quantitative indices presented in Table 4 suggested more sustained improvement for panic disorder than for generalized anxiety, total anxiety symptoms, and depressive symptoms.

The quantitative nonoverlap indices were generally consistent with these visual findings. During the baseline-to-treatment transition, effect estimates showed considerable variability across outcome measures, ranging from negligible to large, indicating that the magnitude of treatment

effects differed among symptom domains. In contrast, comparisons between the treatment and follow-up phases generally yielded small-to-moderate effects, with only a few exceptions demonstrating larger effects, suggesting that treatment gains were largely maintained despite some attenuation over follow-up.

3. Integrated findings across participants

To facilitate cross-participant interpretation, the visual and quantitative findings were subsequently examined across both participants for each outcome measure. Figures 1–5 display the trajectories of the outcome measures for both participants, and the accompanying summary tables present the corresponding visual and quantitative indices.

A) in PD:

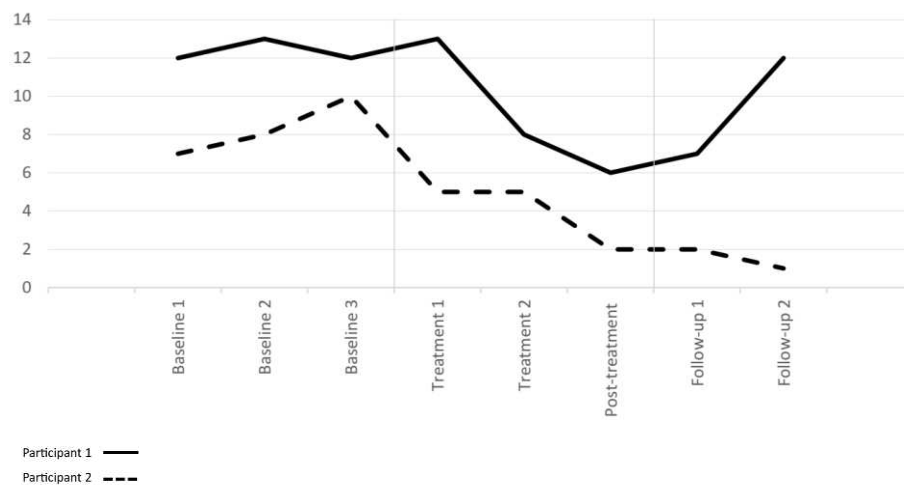


Figure 1. Trajectories of panic disorder symptom scores across study phases for both participants

Figure 1 illustrates the trajectories of panic disorder symptoms for both participants across the baseline, treatment, and follow-up phases. Participant 1 demonstrated a relatively stable baseline trend, followed by a marked reduction in symptom severity during treatment. However, symptom scores increased during follow-up, indicating partial loss of treatment gains. In contrast, Participant 2 showed a gradual increase in symptom severity during baseline, followed by a pronounced decline during treatment that was maintained throughout the follow-up phase. Overall, visual inspection together with the quantitative indices suggested a more durable treatment response for Participant 2 than for Participant 1.

B) in GAD:

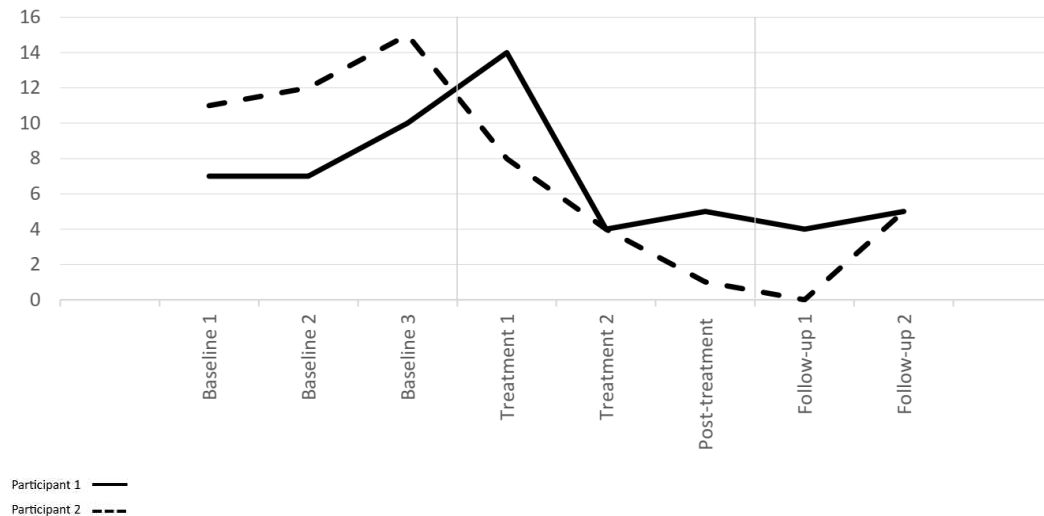


Figure 2. Trajectories of generalized anxiety symptom scores across study phases for both participants

Figure 2 illustrates the trajectories of generalized anxiety symptom scores for both participants across the baseline, treatment, and follow-up phases. Both participants demonstrated increasing trends during baseline, followed by marked reductions in symptom severity during the treatment phase. Participant 1 maintained these improvements throughout follow-up, with only minor fluctuations in symptom scores. In contrast, Participant 2 continued to show decreasing symptom severity across most of the follow-up period, although symptom scores increased at the final follow-up assessment. Overall, visual inspection together with the quantitative indices suggested sustained treatment gains for Participant 1 and a generally sustained treatment response with slight attenuation at the final follow-up for Participant 2.

Because only Participant 1 met the diagnostic criteria for agoraphobia, the findings for this outcome are presented separately.

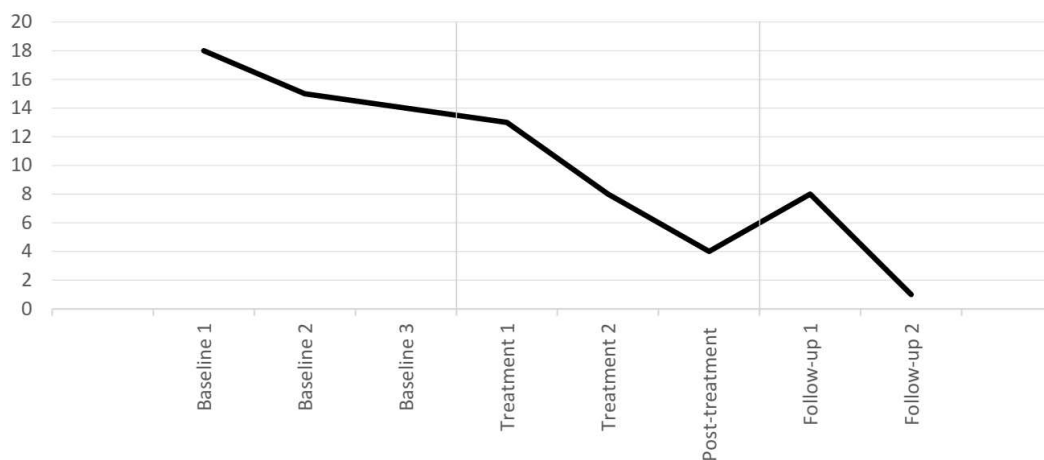


Figure 3. Trajectory of agoraphobia symptom scores across study phases

Figure 3 illustrates the trajectory of agoraphobia symptom scores across the baseline, treatment, and follow-up phases for Participant 1. Symptom severity showed a consistent decreasing trend from baseline through treatment, with treatment gains largely maintained during follow-up despite a slight increase at the first follow-up assessment. Overall, visual inspection together with the quantitative indices suggested a strong

treatment response during the intervention phase, with most treatment gains maintained throughout follow-up.

C) Total Anxiety Symptoms

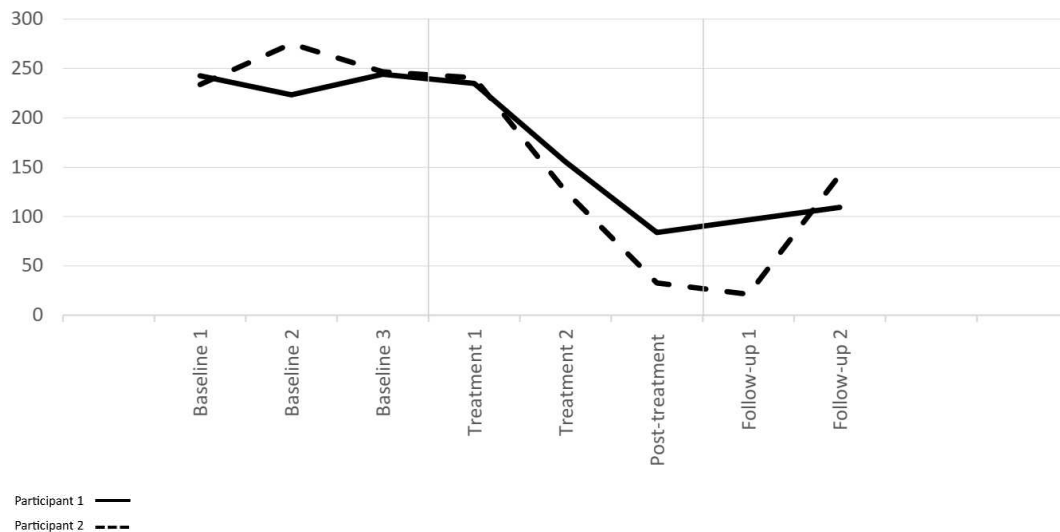
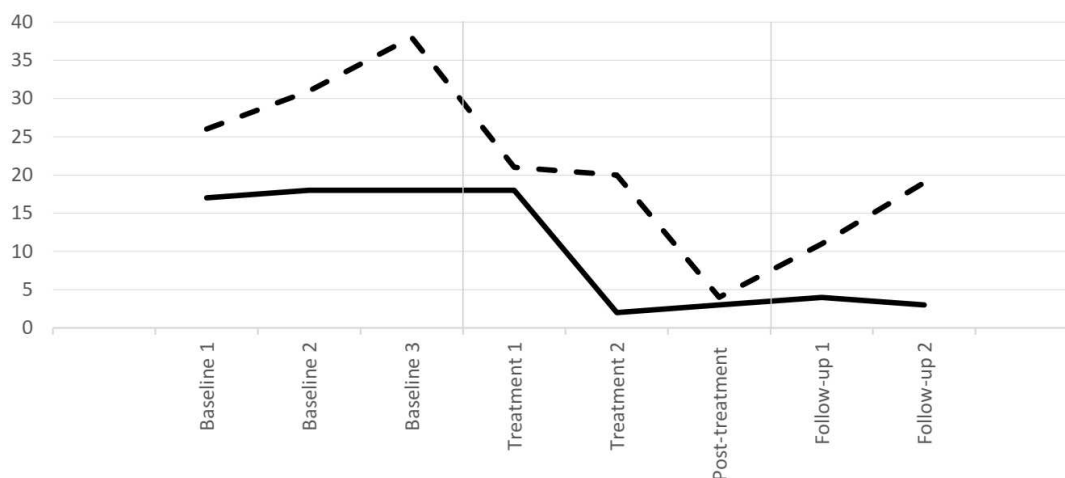


Figure 4. Trajectories of total anxiety symptom scores across study phases for both participants

Figure 4 illustrates the Both participants exhibited relatively stable trends during the baseline phase, followed by distinct reductions in symptom severity during the active intervention phase. However, these clinical gains were not fully maintained during the follow-up period. Participant 1 showed an increasing trend in symptom scores post-treatment, indicating a partial loss of treatment gains. Participant 2 demonstrated a continued decrease in symptoms at the first follow-up, which subsequently rebounded by the second follow-up, suggesting limited long-term maintenance of therapeutic gains. Overall, visual inspection integrated with quantitative indices reveals a comparable pattern of treatment response across participants, characterized by acute improvement during treatment and a gradual attenuation of gains during follow-up.

D) Depression



Participant 1 —
Participant 2 - - -

Figure 5. Trajectories of depressive symptom scores across study phases for both participants

Visual analysis of Figure 5 reveals distinct response patterns regarding the impact of TGCBT on depressive symptoms. For Participant 1, depressive symptoms remained relatively stable during the baseline phase, followed by a sharp and significant reduction during the active treatment phase. This therapeutic gain was successfully maintained with minimal fluctuation during the follow-up period. Between-phase analysis for Participant 1 indicates a moderate-to-strong treatment effect from baseline to treatment, which successfully stabilized into a robust maintenance effect during follow-up.

In contrast, Participant 2 exhibited a clear worsening (increasing) trend in depressive symptoms during the baseline phase, which promptly reversed into a consistent downward trajectory upon entering the active treatment phase, reaching its lowest point at post-treatment. However, during the follow-up phase, Participant 2 experienced a notable rebound in symptoms. Consequently, while between-phase comparisons for Participant 2 indicate high acute treatment response during the active intervention, the long-term sustainability of these gains was limited during the follow-up period.

To facilitate an overall interpretation of the visual and quantitative findings, Table 5 summarizes the treatment response patterns observed across participants for each outcome measure.

Table 5. Summary of the treatment response patterns across participants based on visual and quantitative analyses

Outcome measure	Participant 1	Participant 2	Cross-participant summary
PD	Improvement during treatment with partial loss of gains at follow-up	Sustained improvement throughout follow-up	Improvement observed in both participants, with stronger maintenance in Participant 2
GAD	Sustained improvement	Improvement with partial loss of gains during follow-up	Overall sustained improvement
Agoraphobia	Sustained improvement with slight attenuation during follow-up	NA	Sustained improvement
Total Anxiety Symptoms	Marked improvement during treatment with limited maintenance	Marked improvement during treatment with limited maintenance	Consistent treatment response with limited maintenance
Depression	Sustained improvement	Improvement with partial loss of gains during follow-up	Improvement in both participants with variable maintenance

4. Clinical Significance Analysis

Clinical significance was evaluated using the Reliable Change Index (RCI) and Mean Baseline Reduction (MBLR). Table 6 summarizes these indices for each outcome measure across the post-

treatment and follow-up assessments, allowing evaluation of whether the observed improvements exceeded established criteria for reliable and clinically meaningful change.

Table 6. Clinical significance indices across outcome measures

Index	Baseline		Post-treatment		Follow-up 1		Follow-up 2		Reliable Change Index (RCI)			Mean Baseline Reduction (MBLR)		
Variable	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	RCI _{post}	RCI _{follow1}	RCI _{follow2}	MBLR _{post}	MBLR _{follow1}	MBLR _{follow2}
PD	10.33	2.83	4	2.83	4	4.24	6	8.49	4.3	4.3	2.94	61.28	61.28	41.92
GAD	10.33	3.30	3	2.83	2	2.83	5	0	4.02	4.57	2.92	70.96	70.96	80.64
Agoraphobia	12	-	3.5	-	5	-	1	-	-	-	-	70.83	58.33	91.67
Total Anxiety Symptoms	244.27	10.7	58.2	36.2	68.9	39.17	125.7	23.19	37.27	35.13	23.72	76.17	71.79	48.54
Depression	24.88	10.2	3.5	0.71	7.5	0.61	11	11.31	4.12	3.33	2.66	85.93	69.86	55.79

As shown in Table 6, RCI values exceeded the critical value of 1.96 for all outcome measures at post-treatment as well as at both follow-up assessments, indicating that the observed improvements represented reliable change with 95% confidence [63]. MBLR values exceeded the recommended 50% criterion at post-treatment and Follow-up 1 for all outcome measures. At Follow-up 2, this criterion continued to be met for generalized anxiety, agoraphobia, and depression, whereas panic disorder and total anxiety symptoms no longer exceeded the threshold, suggesting attenuation of clinically meaningful improvement over time [66].

Discussion

The present study examined the preliminary efficacy of transdiagnostic cognitive-behavioral group therapy (TGCBT) in two Iranian participants with heterogeneous anxiety disorders using a concurrent multiple-baseline single-case design. Visual inspection, supported by quantitative nonoverlap indices and clinical significance analyses, demonstrated consistent reductions in disorder-specific symptom severity during treatment. Treatment gains were generally maintained during follow-up for generalized anxiety disorder and agoraphobia, whereas treatment gains for panic disorder and total anxiety symptoms were only partially maintained during follow-up. RCI values exceeded the critical threshold for all outcome measures, while MBLR indicated sustained clinically meaningful improvement for generalized anxiety, agoraphobia, and depression at the final follow-up assessment.

An important finding of the present study was that maintenance of treatment gains differed across outcome measures. Improvements in generalized anxiety, agoraphobia, and depression generally remained clinically meaningful throughout follow-up, whereas panic disorder in Participant 1 and total anxiety symptoms in both participants showed partial loss of treatment gains over time. One possible interpretation is that TGCBT effectively targeted the core symptomatology of the primary anxiety disorders, whereas broader emotional distress remained more vulnerable to subsequent life stressors after treatment. From a clinical perspective, these findings suggest that although the protocol can achieve meaningful symptom reduction, maintenance of broader emotional improvement may benefit from booster sessions or structured relapse-prevention strategies following treatment completion. Furthermore, Participant 2 reported learning of a serious cancer diagnosis in a family member shortly before the final follow-up assessment. Although no causal inference can be drawn, this event coincided with the modest increase observed in generalized anxiety and depressive symptoms, highlighting the importance of considering significant life events when interpreting follow-up trajectories.

In examining the efficacy of the protocol, only one study was found as a “group case study” reporting the scores of two participants out of the six in the group [25]. In this study, the participants were described as having one with a primary diagnosis of PD with agoraphobia and the other with SAD. The use of diagnosis-specific outcome measures allowed a more precise evaluation of disorder-specific symptom change than transdiagnostic symptom measures alone. Unlike previous reports, the present study combined repeated visual analysis with quantitative nonoverlap indices and clinical significance analyses, allowing evaluation not only of symptom reduction but also of the temporal pattern and maintenance of therapeutic change across phases.

To our knowledge, previous studies evaluating Norton's TGCBT have not reported repeated visual analyses across multiple assessment points or examined changes in level, trend, stability, and maintenance throughout baseline, treatment, and follow-up phases. Consequently, direct comparison of temporal response patterns with the present findings is currently limited. Most previous TGCBT studies have evaluated treatment outcomes using conventional group-level statistical analyses. Consequently, little evidence is available regarding within-participant trajectories of change, stability of treatment gains, or phase-specific response patterns that can be captured through single-case methodology.

The available evidence for Norton's protocol has largely originated from the same research group, highlighting the importance of independent replication across different cultural and clinical settings. The present findings contribute preliminary evidence from an Iranian sample and support the need for further replication in diverse populations.

The observation of clinically meaningful improvement across participants with different combinations of anxiety disorders is broadly consistent with the transdiagnostic rationale of TGCBT. Nevertheless, because only two participants were included, the present findings should be interpreted as preliminary evidence supporting the protocol's potential applicability across diagnostically heterogeneous anxiety presentations rather than definitive evidence for its transdiagnostic effectiveness. However, these findings should not be interpreted as definitive evidence for the transdiagnostic or group-based effectiveness of the protocol, given the limited sample size and individual mode of delivery.

One methodological consideration concerns the individual delivery of a protocol originally developed for group treatment. Although Norton's treatment manual permits implementation in both individual and group formats, the present study adopted individual delivery to maximize experimental control during this preliminary limited-efficacy evaluation and to permit repeated within-participant assessment using a concurrent multiple-baseline design. Consequently, the present findings should be interpreted as evidence regarding the clinical performance of the therapeutic protocol itself rather than the effectiveness of its group therapeutic processes. Evaluation of the protocol under its intended group format was addressed in a subsequent phase of this research program. Evaluation of the protocol under its intended group format was addressed in a subsequent phase of this research program and will provide a more direct assessment of group therapeutic processes.

Limitations

The findings of the present study should be interpreted in light of several limitations. First, the study employed a concurrent multiple-baseline single-case design including only two participants. Although this design provides strong experimental control over within-participant change, it is not intended to support statistical generalization to broader clinical populations. Accordingly, the present findings should be

considered preliminary and require replication in larger samples and group-based clinical trials. Second, participants were recruited using purposive convenience sampling, which may have introduced selection bias [68] and may limit the representativeness of the sample. Third, although Norton's treatment manual permits both individual and group implementation [7], the protocol was delivered individually in the present study to maximize experimental control and permit repeated assessment within the multiple-baseline design. Consequently, the findings primarily reflect the performance of the therapeutic protocol under controlled experimental conditions rather than the effectiveness of group therapeutic processes, which should be examined separately in future group-based investigations. Fourth, diagnostic assessment was conducted using the SCID-5 because a psychometrically validated Persian version of the ADIS-5 was unavailable. Although the SCID-5 provides reliable DSM-5 diagnoses, the use of ADIS-5 would have allowed a more detailed assessment of anxiety-specific clinical characteristics. Fifth, all stages of the study—including participant recruitment, screening, diagnostic assessment, treatment delivery, and outcome assessment—were conducted by the first author. Although this ensured procedural consistency across all study phases, the absence of independent assessors may have increased the potential for assessor-related bias. Finally, the follow-up phase included only two repeated assessments. Although this did not affect the calculation of nonoverlap indices or clinical significance measures, it limited visual evaluation of trend stability during follow-up. In addition, repeated administration of the same outcome measures may have introduced testing effects, including practice effects and response familiarity associated with repeated self-report assessment, although the relatively long intervals between assessments were intended to minimize these effects.

Future research should replicate these findings under the protocol's intended group format using larger and more diverse clinical samples, independent outcome assessors, longer follow-up periods, and culturally validated diagnostic instruments.

Conclusion

This preliminary concurrent multiple-baseline study provides initial evidence supporting the preliminary evidence for the efficacy of TGCBT for diagnostically heterogeneous anxiety disorders in an Iranian clinical context. Consistent reductions in disorder-specific symptoms, together with reliable and clinically meaningful change across most outcome measures, justify further evaluation of the protocol in larger group-based controlled studies. Future controlled group-based studies are needed to determine whether these findings generalize to routine clinical practice and broader clinical populations.

Abbreviations

ADIS	Anxiety Disorders Interview Schedule
BDI-II	Beck Depression Inventory – Second Version
CBT	Cognitive Behavioural Therapy
DSM	Diagnostic and Statistical Manual of Mental Disorders
FSAQ	Four System Anxiety Questionnaire
FSS-III	Fear Survey Schedule – Third Version
GAD	Generalized Anxiety Disorder
IRD	Improvement Rate Difference
MBLR	Mean Baseline Reduction
NAP	Nonoverlap of All Pairs
PD	Panic Disorder

PDSS-SR	Panic Disorder Severity Scale – Self-Report
PEM	Percentage of Data Exceeding the Median
PND	Percent of Non-overlapping Data
POD	Percent of Overlapping Data
RCI	Reliable Change Index
RCT	Randomized Clinical Trial
SAD	Social Anxiety Disorder
SCED	Single-Case Experimental Design
SCID	Structured Clinical Interview for DSM
STAI	State-Trait Anxiety Inventory
TGCBT	Transdiagnostic Group Cognitive Behavioural Therapy

Acknowledgements

The authors sincerely thank the clinicians and staff of the Counseling Centers of Shahid Beheshti University and the Military Psychiatry 505 Clinic for their support with participant recruitment and study implementation. We also thank Dr. Vahid Nejati, Dr. Azin Sarraj, Dr. Ali Ghaednia-Jahromi, Dr. Samira Masoumian, Dr. Amir-Hossein Rahnjat, and Dr. Javad Naeimi for their valuable support throughout the project.

Authors' Contributions

Fatemeh Akhavan-Abiri: Conceptualization, Methodology, Investigation, Formal analysis, Data curation, Writing – original draft.

Mohammad-Reza Shaeiri: Conceptualization, Supervision, Clinical supervision, Writing – review & editing.

Hojatollah Farahani: Methodology, Formal analysis, Statistical supervision.

Arsia Taghva: Participant recruitment, Clinical coordination, Resources.

Funding

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors. The study was conducted as part of the first author's Ph.D. dissertation in Clinical Psychology.

Data availability

Because this study involved a small number of participants and the dataset contains potentially identifiable clinical information, the data are not publicly available. De-identified data may be made available by the corresponding author upon reasonable request, subject to ethical approval and confidentiality requirements.

Declarations

Ethics Approval

This study was approved by the Research Ethics Committee of Shahed University, Tehran, Iran (Approval No. IR.SHAHED.REC.1402.126). All procedures involving human participants were conducted in accordance with the ethical standards of the institutional research committee and the 1964 Declaration of Helsinki and its later amendments. The study was also registered with the Iranian Registry of Clinical Trials (IRCT No. 76032).

Consent to Participate

Written informed consent was obtained from all participants prior to study enrollment. Before providing consent, all participants received a complete explanation of the study procedures, potential benefits and risks, and their right to withdraw from the study at any time without penalty. Participants were also assured that all personal information would be kept confidential and used solely for research purposes.

Consent for Publication

Not applicable.

Conflict of Interests

The authors declare that they have no competing interests.

References

1. APA. Diagnostic Statistical Manual of Mental Disorders Fifth Edition – Text Revised (DSM-5-TR). Washington DC: APA; 2022.
2. Kessler RC, Chiu WT, Demler O, Walters EE. Prevalence, severity, and comorbidity of 12-month DSM-IV disorders in the National Comorbidity Survey Replication. *Archives of general psychiatry*. 2005;62(6):617-27.<https://doi.org/http://dx.doi.org/10.1001/archpsyc.62.6.617>
3. Sadock BJ, Sadock VA, Ruiz P. Kaplan and Sadock's comprehensive textbook of psychiatry: Lippincott Williams & Wilkins; 2017.
4. Greenberg PE, Sisitsky T, Kessler RC, Finkelstein SN, Berndt ER, Davidson JR, et al. The economic burden of anxiety disorders in the 1990s. *Journal of clinical psychiatry*. 1999;60(7):427-35.<https://doi.org/http://dx.doi.org/10.4088/jcp.v60n0702>
5. Dickson SJ, Oar EL, Kangas M, Johnco CJ, Lavell CH, Seaton AH, et al. A systematic review and meta-analysis of impairment and quality of life in children and adolescents with anxiety disorders. *Clinical Child and Family Psychology Review*. 2024;27(2):342-56.<https://doi.org/https://doi.org/10.1007/s10567-024-00484-5>
6. Trent ES, Storch EA. Cognitive behavioral therapy for anxiety disorders. *Psychiatric Clinics*. 2024;47(4):673-88.<https://doi.org/https://doi.org/10.1016/j.psc.2024.04.011>
7. Norton PJ. Group cognitive-behavioral therapy of anxiety: A transdiagnostic treatment manual. New York: Guilford Press; 2012.
8. Allen LB, Ehrenrich JT, Barlow DH. A Unified Treatment for Emotional Disorders: Applications With Adults and Adolescents (Invited Article). *Japanese Journal of Behavior Therapy*. 2005;31(1):3-30.https://doi.org/https://doi.org/10.24468/jjbt.31.1_3
9. Clark DA, Taylor S. The transdiagnostic perspective on cognitive-behavioral therapy for anxiety and depression: new wine for old wineskins? *Journal of Cognitive Psychotherapy*. 2009;23(1):60-6.<https://doi.org/https://doi.org/10.1891/0889-8391.23.1.60>
10. McEvoy PM, Nathan P, Norton PJ. Efficacy of transdiagnostic treatments: a review of published outcome studies and future research directions. *Journal of Cognitive Psychotherapy*. 2009;23(1):20-33.<https://doi.org/http://dx.doi.org/10.1891/0889-8391.23.1.20>
11. Mansell W, Harvey A, Watkins E, Shafran R. Conceptual foundations of the transdiagnostic approach to CBT. *Journal of Cognitive Psychotherapy*. 2009;23(1):6-19.<https://doi.org/https://doi.org/10.1891/0889-8391.23.1.6>

12. Meidlinger PC, Hope DA. The new transdiagnostic cognitive behavioral treatments: Commentary for clinicians and clinical researchers. *Journal of anxiety disorders*. 2017;46:101-9.<https://doi.org/http://dx.doi.org/10.1016/j.janxdis.2016.11.002>
13. Schaeuffele C, Schulz A, Knaevelsrud C, Renneberg B, Boettcher J. CBT at the crossroads: The rise of transdiagnostic treatments. *International Journal of Cognitive Therapy*. 2021;14(1):86-113.<https://doi.org/https://doi.org/10.1007/s41811-020-00095-2>
14. Harris KR, Norton PJ. Transdiagnostic cognitive behavioral therapy for the treatment of emotional disorders: A group case study. *Clinical Case Studies*. 2018;17(6):387-405.<https://doi.org/https://doi.org/10.1177/1534650118793938>
15. Norton PJ, Paulus DJ. Toward a unified treatment for emotional disorders: update on the science and practice. *Behavior Therapy*. 2016;47(6).<https://doi.org/https://doi.org/10.1016/j.beth.2015.07.002>
16. Norton PJ. An open trial of a transdiagnostic cognitive-behavioral group therapy for anxiety disorder. *Behavior Therapy*. 2008;39(3):242-50.<https://doi.org/https://doi.org/10.1016/j.beth.2007.08.002>
17. Norton PJ. A randomized clinical trial of transdiagnostic cognitive-behavioral treatments for anxiety disorder by comparison to relaxation training. *Behavior Therapy*. 2012;43(3):506-17.<https://doi.org/https://doi.org/10.1016/j.beth.2010.08.011>
18. Norton PJ, Barrera TL. Transdiagnostic versus diagnosis-specific CBT for anxiety disorders: A preliminary randomized controlled noninferiority trial. *Depression and anxiety*. 2012;29(10):874-82.<https://doi.org/https://doi.org/10.1002/da.21974>
19. Norton PJ, Barrera TL, Mathew AR, Chamberlain LD, Szafranski DD, Reddy R, et al. Effect of transdiagnostic CBT for anxiety disorders on comorbid diagnoses. *Depression and Anxiety*. 2013;30(2):168-73.<https://doi.org/https://doi.org/10.1002/da.22018>
20. Norton PJ, Hayes SA, Hope DA. Effects of a transdiagnostic group treatment for anxiety on secondary depression. *Depression and anxiety*. 2004;20(4):198-202.<https://doi.org/https://doi.org/10.1002/da.20045>
21. Norton PJ, Hope DA. Preliminary evaluation of a broad-spectrum cognitive-behavioral group therapy for anxiety. *Journal of Behavior Therapy and Experimental Psychiatry*. 2005;36(2):79-97.<https://doi.org/https://doi.org/10.1016/j.jbtep.2004.07.002>
22. Norton PJ, Philipp LM. Transdiagnostic approaches to the treatment of anxiety disorders: A quantitative review. *Psychotherapy: Theory, Research, Practice, Training*. 2008;45(2):214-26.<https://doi.org/https://doi.org/10.1037/0033-3204.45.2.214>
23. Norton PJ, Provencher MD, Kilby CJ, Roberge P. Impact of group transdiagnostic cognitive-behavior therapy for anxiety disorders on comorbid diagnoses: Results from a pragmatic randomized clinical trial in primary care. *Depression and Anxiety*. 2021;38(7):749-56.<https://doi.org/https://doi.org/10.1002/da.23184>
24. Roberge P, Provencher MD, Gaboury I, Gosselin P, Vasiliadis H-M, Benoît A, et al. Group transdiagnostic cognitive-behavior therapy for anxiety disorders: a pragmatic randomized clinical trial. *Psychological Medicine*. 2020;52(13):2460-70.<https://doi.org/https://doi.org/10.1017/S0033291720004316>
25. Norton PJ, Hope DA. The “Anxiety Treatment Protocol” a group case study demonstration of a transdiagnostic group cognitive—Behavioral therapy for anxiety disorders. *Clinical Case Studies*. 2008;7(6):538-54.<https://doi.org/https://doi.org/10.1177/1534650108321307>
26. Chapdelaine A, Vasiliadis H-M, Provencher MD, Norton PJ, Roberge P. Cost-effectiveness of transdiagnostic group cognitive behavioural therapy for anxiety disorders v. treatment as usual: economic evaluation of a pragmatic randomized controlled trial over an 8-month time horizon using self-reported data. *Psychological medicine*. 2023;53(14):6570-82.<https://doi.org/https://doi.org/10.1017/S0033291722003920>

27. Luong HK, Drummond SP, Norton PJ. Elements of the therapeutic relationship in CBT for anxiety disorders: A systematic review. *Journal of anxiety disorders*. 2020;76:102322 (1-15).<https://doi.org/https://doi.org/10.1016/j.janxdis.2020.102322>
28. Norton PJ, Klenck SC, Barrera TL. Sudden gains during cognitive-behavioral group therapy for anxiety disorders. *Journal of anxiety disorders*. 2010;24(8):887-92.<https://doi.org/https://doi.org/10.1016/j.janxdis.2010.06.012>
29. Paulus DJ, Talkovsky AM, Heggeness LF, Norton PJ. Beyond negative affectivity: A hierarchical model of global and transdiagnostic vulnerabilities for emotional disorders. *Cognitive Behaviour Therapy*. 2015;44(5):389-405.<https://doi.org/https://doi.org/10.1080/16506073.2015.1017529>
30. Vincent L, Norton PJ. Predictors and consequences of sudden gains in transdiagnostic cognitive-behavioural therapy for anxiety disorders. *Cognitive Behaviour Therapy*. 2019;48(4):265-84.<https://doi.org/https://doi.org/10.1080/16506073.2018.1513557>
31. Norton PJ, Kazantzis N. Dynamic relationships of therapist alliance and group cohesion in transdiagnostic group CBT for anxiety disorders. *Journal of consulting and clinical psychology*. 2016;84(2):146.<https://doi.org/https://doi.org/10.1037/ccp0000062>
32. L. GD, R. KT, M. G. Incorporating feasibility protocols in intervention research. *School Psychology* 2021;84:1-18.<https://doi.org/https://doi.org/10.1037/ccp0000062>
33. Bowen DJ, Kreuter M, Spring B, Cofta-Woerpel L, Linnan L, Weiner D, et al. How we design feasibility studies. *American journal of preventive medicine*. 2009;36(5):452-7.<https://doi.org/https://doi.org/10.1016/j.amepre.2009.02.002>
34. Akhavan-Abiri F, Shaeiri MR, Farahani H, Taghva A. Feasibility of Norton Transdiagnostic Group Cognitive-Behavioural Therapy for Anxiety Disorders in Iranian Samples: The Viewpoint of Experts, Therapist, and Patients. *Clinical Psychology and Personality*. 2026;24(1):309-26 [Persian].<https://doi.org/https://doi.org/10.22070/cpap.2026.20984.1801>
35. Kazdin AE. *Single-Case Research Designs: Methods for Clinical and Applied Settings*, 3rd ed: Oxford University Press; 2020.
36. Tate RL, Perdices M, Rosenkoetter U, Shadish W, Vohra S, Barlow DH, et al. The single-case reporting guideline in behavioural interventions (SCRIBE) 2016 statement. *Physical therapy*. 2016;96(7):e1-e10.<https://doi.org/https://doi.org/10.1037/arc0000026>
37. Tongco MDC. Purposive sampling as a tool for informant selection. *Journal of Ethnobiology*. 2007
38. First MB, Williams JB, Karg RS, Spitzer RL. *User's guide for the SCID-5-CV Structured Clinical Interview for DSM-5® disorders: Clinician version*. Washington DC: American Psychiatric Publishing, Inc.; 2016.
39. Shankman SA, Funkhouser CJ, Klein DN, Davila J, Lerner D, Hee D. Reliability and validity of severity dimensions of psychopathology assessed using the Structured Clinical Interview for DSM-5 (SCID). *International Journal of Methods in Psychiatric Research*. 2017;27(1):e1590.<https://doi.org/https://doi.org/10.1002/mpr.1590>
40. Osório FL, Loureiro SR, Hallak JEC, Machado-de-Sousa JP, Ushirohira JM, Baes CV, et al. Clinical validity and intrarater and test-retest reliability of the Structured Clinical Interview for DSM-5–Clinician Version (SCID-5-CV). *Psychiatry and Clinical Neurosciences*. 2019;73(12):754-60.<https://doi.org/https://doi.org/10.1111/pcn.12931>
41. Mohammadkhani P, Forouzan AS, Hooshyari Z, Abasi I. Psychometric properties of Persian version of structured clinical interview for DSM-5-research version (SCID-5-RV): a diagnostic accuracy study. . *Iranian Journal of Psychiatry and Behavioral Sciences*. 2020;14(2):e100930.<https://doi.org/https://doi.org/10.5812/ijpbs.100930>
42. Shabani A, Masoumian S, Zamirinejad S, Hejri M, Pirmorad T, Yaghmaeezadeh H. Psychometric properties of structured clinical interview for DSM-5 disorders-clinician version (SCID-5-CV). *Brain and Behavior*. 2021;11(5):e01894.<https://doi.org/https://doi.org/10.1002/brb3.1894>

43. Koksai F, Power KG. Four Systems Anxiety Questionnaire (FSAQ): a self-report measure of somatic, cognitive, behavioral and feeling components. *Journal of Personality Assessment*. 1990;54(3 & 4):543-5.<https://doi.org/https://doi.org/10.1080/00223891.1990.9674018>
44. Janda L. *The Psychologist's book of personality*. New York: John Wiley & sons, Inc; 2001.
45. Maredpour AR, Shaeiri MR, Kafi M. The Study of Psychometric Properties of the Four System Anxiety Questionnaire (FSAQ). *Clinical Psychology and Personality*. 2010;43(17):11-20 [Persian]
46. Houck PR, Spiegel DA, Shear MK, Rucci P. Reliability of the self-report version of the panic disorder severity scale. *Depression and anxiety*. 2002;15(4):183-5.<https://doi.org/https://doi.org/10.1002/da.10049>Digital
47. Shear MK, Brown TA, Barlow DH, Money R, Sholomskas DE, Woods SW, et al. Multicenter collaborative panic disorder severity scale. *American journal of psychiatry*. 1997;154(11):1571-5.<https://doi.org/https://doi.org/10.1176/ajp.154.11.1571>
48. Roberge P, Marx P, Couture J, Carrier N, Benoît A, Provencher MD, et al. French adaptation and validation of the Panic Disorder Severity Scale—self-report. *BMC psychiatry*. 2022;22(1):434.<https://doi.org/https://doi.org/10.1186/s12888-022-03989-x>
49. Akhavan-Abiri F, Shaeiri MR, Farahani H, Taghva A. Preliminary Psychometric Properties of Panic Disorder Severity Scale—Self Report Version: Validity, Reliability, and the Cut-Off Point in Persian Clinical Samples. *Brain and Behavior*. 2026;16(e71524).<https://doi.org/https://doi.org/10.1002/brb3.71524>
50. Spitzer RL, Kroenke K, Williams JB, Löwe B. A brief measure for assessing generalized anxiety disorder: the GAD-7. *Archives of internal medicine*. 2006;166(10):1092-7.<https://doi.org/https://doi.org/doi:10.1001/archinte.166.10.1092>
51. Naeinian MR, Shaeiri MR, Sharif M, Hadian M. To Study Reliability and Validity for A Brief Measure for Assessing Generalized Anxiety Disorder (GAD-7). *Clinical Psychology and Personality*. 2011;4(3):41-50 [Persian]
52. Wolpe J, Lang PJ. A fear survey schedule for use in behaviour therapy. *Behaviour Research and Therapy*. 1964;2(1):27-30.[https://doi.org/https://doi.org/10.1016/0005-7967\(64\)90051-8](https://doi.org/https://doi.org/10.1016/0005-7967(64)90051-8)
53. Spinks PM. An item and factor analysis of the FSS (III). *Personality and Individual Differences*. 1980;1(4):363-70.[https://doi.org/https://doi.org/10.1016/0191-8869\(80\)90020-3](https://doi.org/https://doi.org/10.1016/0191-8869(80)90020-3)
54. Bakhshipour A, Bairami M, Kakaee A. Psychometric Properties of Fear Survey Schedule-Third Version (FSS-III). *Psychological Research* 2009;1(12):40-61 [Persian]
55. Beck AT, Steer RA, Brown GK. *Manual for the Beck Depression Inventory*. San AntonioTX: Psychological Corporation; 1996.
56. Ghassemzadeh H, Mojtabai R, Karamghadiri N, Ebrahimkhani N. Psychometric properties of a Persian-language version of the Beck Depression Inventory-Second edition: BDI-II-PERSIAN. *Depression and anxiety*. 2005;21(4):185-92.<https://doi.org/https://doi.org/10.1002/da.20070>
57. Lane JD, Gast DL. Visual analysis in single case experimental design studies: Brief review and guidelines. *Neuropsychological rehabilitation*. 2014;24(3-4):445-63.<https://doi.org/https://doi.org/10.1080/09602011.2013.815636>
58. Noferesti A, Hassanabadi HR. Data analysis in single case experimental design studies. *Rooyesh*. 2019;7(12):291-306 [Persian]
59. Parker RI, Vannest KJ, Davis JL, Sauber SB. Combining nonoverlap and trend for single-case research: Tau-U. *Behavior therapy*. 2011;42(2):284-99.<https://doi.org/https://doi.org/10.1016/j.beth.2010.08.006>
60. Parker RI, Vannest K. An improved effect size for single-case research: Nonoverlap of all pairs. *Behavior therapy*. 2009;40(4):357-67.<https://doi.org/https://doi.org/10.1016/j.beth.2008.10.006>
61. Ma H-H. An alternative method for quantitative synthesis of single-subject researches: Percentage of data points exceeding the median. *Behavior modification*. 2006;30(5):598-617.<https://doi.org/https://doi.org/10.1177/0145445504272974>

62. Parker RI, Vannest KJ, Brown L. The improvement rate difference for single-case research. *Exceptional children*. 2009;75(2):135-50.[https://doi.org/https://doi.org/10.1177/001440290907500201](https://doi.org/10.1177/001440290907500201)
63. Asghari Moghaddam MA, Shairi MR. Treatment Changes Clinical Significance Method: Properties, Calculation Method, Decision Making and Limitations. *Clinical Psychology and Personality*. 2014;21(10):191-200 [Persian]
64. Campbell JM. Statistical comparison of four effect sizes for single-subject designs. *Behavior modification*. 2004;28(2):234-46.[https://doi.org/https://doi.org/10.1177/0145445503259264](https://doi.org/10.1177/0145445503259264)
65. Jacobson NS, Truax P. Clinical significance: a statistical approach to defining meaningful change in psychotherapy research. *Journal of consulting and clinical psychology*. 1991;59(1):12.[https://doi.org/https://doi.org/10.1037/0022-006X.59.1.12](https://doi.org/10.1037/0022-006X.59.1.12)
66. Alresheed F, Hott BL, Bano C. Single Subject Research: A Synthesis of Analytic Methods. *Journal of Special Education Apprenticeship*. 2013;2(1):1-18.[https://doi.org/https://doi.org/10.58729/2167-3454.1015](https://doi.org/10.58729/2167-3454.1015)
67. Vannest KJ, Parker, R. I., Gonen, O., & Adiguzel, T. Single Case Research: web-based calculators for SCR analysis. (Version 2.0) [Web-based application] College Station, TX: Texas A&M; University2016 [Available from: <https://singlecaseresearch.org/>].
68. Jadad AR, Enkin MW. *Randomized controlled trials: questions, answers and musings*. Toronto: John Wiley & Sons; 2007.

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- [MyEndNoteLibrary.enl](#)
- [Tablesvisualanalysis.docx](#)
- [StudyProtocol.docx](#)