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Effect of Cognitive Behavioral Therapy on Depression

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ABSTRACT

Background: Depression is a prevalent and disabling condition, and brief, structured psychotherapies that can be delivered efficiently remain important in applied settings. Objective: To evaluate whether a brief five-session cognitive behavioral therapy (CBT) program is associated with reduced depressive symptom severity measured using the DASS-21 depression subscale. Methods: A single-arm pre–post (pre-experimental) study delivered five individual CBT sessions of approximately 60 minutes over two months. Depressive symptoms were assessed immediately before the first session and after completion of the fifth session. The prespecified primary endpoint was within-participant change in DASS-21 depression score. Analyses emphasized paired change estimates with exploratory inferential testing. Results: Among eligible participants with baseline depressive symptoms (n=5), mean DASS-21 depression scores decreased from 7.2±1.9 to 5.2±1.3, with a mean paired reduction of 2.0 points (95% CI: -3.24 to -0.76) and a large within-subject effect size (Cohen's dz=-2.00). Severity-category transitions showed 80% improved by at least one category, including 100% of mild cases shifting to normal and 66.7% of moderate cases shifting to mild. Conclusion: Depressive symptom scores and severity categories improved in most participants after brief CBT, supporting feasibility and suggesting potential benefit, while indicating the need for larger controlled studies with prespecified follow-up to confirm effectiveness. Keywords: cognitive behavioral therapy; depression; DASS-21; brief psychotherapy; pre–post study.

Keywords

Migraine with aura; MIDAS; MSQ; disability; bankers; ICHD-3.

INTRODUCTION

Depressive disorders contribute substantially to global morbidity and functional impairment, with a disproportionate share of years lived with disability across diverse health systems and income settings (1). Beyond emotional distress, depression commonly co-occurs with chronic medical conditions and is associated with measurable decrements in overall health status and daily functioning, reinforcing the need for scalable, evidence-based psychological interventions that can be delivered within realistic service constraints (2). In routine clinical practice, depression also remains under-recognized and variably diagnosed in primary-care and general health settings, which can delay timely intervention and worsen outcomes (3,4). These public health and clinical challenges underscore the importance of brief, structured therapies that can be deployed efficiently while maintaining therapeutic rigor.

Cognitive behavioral therapy (CBT) is among the most widely studied psychological treatments for depression and is grounded in the premise that maladaptive cognitions and behavioral patterns sustain depressive affect and functional limitations. The behavioral foundations of this approach emerged from early learning theory frameworks emphasizing conditioned responses and the role of environment in shaping behavior (5). Subsequent developments integrated cognitive models, particularly the observation that depressed patients experience recurrent negative automatic thoughts and biased appraisals of self, world, and future, leading to structured methods for identifying, testing, and modifying dysfunctional beliefs (6). Within this framework, CBT is typically operationalized as a collaborative, goal-oriented, time-limited intervention incorporating psychoeducation, behavioral activation, cognitive restructuring, problem-solving, and relapse prevention strategies, with the intent of producing durable changes in coping and affect regulation (6).

The clinical effectiveness of CBT for depressive symptoms has been supported by multiple evidence syntheses, positioning it as a viable first-line or adjunctive psychotherapy across a range of depressive presentations (7). At the same time, important nuances have emerged in the broader evidence base, including indications that pooled estimates of CBT's antidepressant effects may vary by era, study context, and methodological features, highlighting the need for careful interpretation and high-quality reporting even in small-scale evaluations (8). Furthermore, psychotherapy research has consistently demonstrated a dose–response pattern in which additional sessions are often associated with greater symptomatic improvement, making the structure, duration, and fidelity of brief CBT formats a central consideration when interpreting outcomes (9). Adherence to manualized CBT principles and competent delivery are also associated with improved outcomes, which reinforces that "CBT" must be described as a standardized, reproducible intervention rather than a loosely defined set of supportive conversations (10).

Clinical heterogeneity is another practical reality when implementing CBT for depression. Comorbid anxiety disorders are common in depressive populations and are associated with greater baseline severity and potentially poorer trajectories, complicating outcome interpretation when comorbidity is not assessed or controlled (11–13). In addition, the presence of personality pathology and other psychiatric comorbidities has been associated with less favorable treatment response in mood disorders, emphasizing the importance of clearly defining the target population and eligibility criteria when evaluating psychotherapy outcomes (14,15). These considerations are particularly salient for brief interventions, where limited contact time may constrain the depth of formulation and the pace of skill acquisition, potentially leading to differential responses across individuals with mild versus more entrenched symptom patterns.

Beyond symptom change, mechanistic research provides convergent support that CBT may influence cognitive and affective processing at the neural systems level, including brain regions implicated in self-referential processing and emotion regulation, which aligns with CBT's theoretical emphasis on modifying maladaptive appraisals and behavioral responses (16). Parallel discussions in the neurobehavioral therapy literature also

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emphasize that psychological interventions can be evaluated not only by symptom reduction but by whether they produce measurable changes in targeted processes, while cautioning that expectancy and non-specific therapeutic factors may inflate perceived benefit without rigorous controls (17). Collectively, these perspectives reinforce that even when symptom improvement is observed, careful design, transparency, and appropriately bounded conclusions remain essential—particularly in small, uncontrolled studies where threats such as regression to the mean, reactivity to assessment, and contextual support effects cannot be excluded.

In applied settings, feasibility-oriented evaluations can still contribute meaningful preliminary evidence by documenting whether brief CBT formats are associated with measurable symptom shifts over short intervals, while clarifying the magnitude and variability of response at the individual level. Small pre–post studies can be useful for hypothesis generation and protocol refinement, provided they clearly specify the population, the intervention components, and the primary outcome definition, and interpret findings conservatively relative to the design's limitations. In this context, the present study focuses on individuals with depressive symptoms receiving a brief CBT program delivered across five one-hour sessions over two months, using change in depressive symptom severity as the primary outcome.

Accordingly, the objective of this study is to evaluate whether a brief, structured course of CBT is associated with a reduction in depressive symptom scores from pre-intervention to post-intervention assessment. The primary research question is whether participants demonstrate a clinically and descriptively meaningful decrease in depression scores following completion of the five-session CBT program.

MATERIAL AND METHODS

This study used a single-arm pre–post (pre-experimental) design to evaluate change in depressive symptom severity following a brief cognitive behavioral therapy (CBT) program. The intervention was delivered over a two-month period as five individual sessions of approximately 60 minutes each, with outcomes assessed immediately before the first CBT session (baseline) and after completion of the fifth session (post-intervention). The prespecified primary outcome was the change in depressive symptom score from baseline to post-intervention.

Participants were adults who agreed to take part and completed the baseline assessment and the full CBT program. Individuals were enrolled as a small feasibility sample, and all participants were assigned a unique study code to ensure de-identification throughout data handling and reporting. To align eligibility with the study objective, depressive symptoms were operationalized using the depression subscale of the Depression, Anxiety and Stress Scales-21 (DASS-21), with inclusion based on a baseline depression score at or above the "mild" threshold as defined by the study's scoring rubric. Participants with baseline scores in the normal range were not retained for the primary effectiveness analysis because they did not meet the operational definition of depressive symptoms for this protocol.

Depressive symptoms were measured using the DASS-21 depression subscale, a widely used self-report instrument developed to quantify depression symptom severity over the reference period, with established psychometric performance across settings (18). The DASS-21 depression subscale score was computed according to standard item scoring procedures, summed to produce an overall depression score, and interpreted using predefined severity categories applied consistently at baseline and post-intervention. For this study, the interpretation thresholds were operationalized as normal (0–4), mild (5–6), and moderate (7–10), and these cut points were used for categorical interpretation alongside continuous score change.

The CBT program was delivered in a structured, protocol-consistent manner emphasizing core CBT elements commonly used in depression-focused brief interventions: psychoeducation and collaborative case formulation; self-monitoring of mood, activities, and automatic thoughts; behavioral activation and activity scheduling; identification and restructuring of negative automatic thoughts through guided discovery; problem-solving strategies and coping planning; and consolidation of skills with relapse-prevention planning and between-session practice tasks (6,7). Session delivery followed a standardized sequence to support reproducibility and reduce therapist-driven variability, and each participant received the same number and duration of sessions within the defined timeframe.

Procedures to reduce bias were incorporated at the design and implementation levels. Measurement bias was addressed by using the same instrument at standardized time points, administering the scale in a consistent manner at baseline and post-intervention, and applying the same scoring and interpretation rules across participants. To limit expectancy effects and demand characteristics, participants were instructed to respond based on their symptoms rather than perceived treatment goals, and outcomes were defined a priori as the change in DASS-21 depression score. Confounding by concurrent psychological interventions or major treatment changes was minimized by documenting participant-reported exposure to additional structured psychotherapy during the study interval and excluding participants with material protocol deviations from the primary analysis. Given the feasibility nature and small sample, no formal adjustment modeling was undertaken; instead, individual trajectories and group-level change estimates were emphasized, and interpretations were bounded to the design's limitations.

The sample size was determined pragmatically as a feasibility-oriented cohort to support protocol implementation and preliminary estimation of within-participant change, rather than to provide confirmatory hypothesis testing. Quantitative analysis focused on within-participant change from baseline to post-intervention. Continuous outcomes were summarized using appropriate descriptive statistics, and the primary effect estimate was the mean paired difference (post minus baseline) with a corresponding standardized within-subject effect size (Cohen's dz) and 95% confidence interval. A paired-sample inferential test was planned for exploratory purposes, using a paired t-test when distributional assumptions were acceptable and a Wilcoxon signed-rank test when normality was not supported, recognizing the limited power and precision inherent to small samples. Missing outcome data were handled using complete-case analysis because the primary endpoint required paired baseline and post-intervention scores.

All participants provided informed consent prior to participation, and confidentiality was maintained by restricting data to de-identified study codes and excluding direct identifiers and sensitive personal attributes from reporting. Data were stored in a restricted-access format, and results were presented in aggregate and/or coded form to prevent re-identification. No pharmacologic agents or invasive procedures were administered as part of this study, and participants who exhibited indications of severe distress during sessions were managed using standard clinical safeguarding procedures, including referral to appropriate clinical services when indicated.

RESULTS

Among eligible participants (baseline depression score ≥ mild; n=5), depressive symptom severity decreased from a baseline mean of 7.2 (SD 1.9) to a post-intervention mean of 5.2 (SD 1.3), corresponding to an average reduction of 2.0 points (95% CI: -3.24 to -0.76) on the DASS-21

depression rubric. Individual changes ranged from a 1-point reduction to a 3-point reduction, with three participants achieving ≥2-point improvement and two participants improving by 1 point (Table 1). Using a paired t-test as an exploratory within-participant comparison, the mean reduction was statistically significant (t = -4.47, p = 0.011), while the nonparametric Wilcoxon signed-rank test indicated a similar directional effect but did not reach conventional significance at this sample size (W = 0, p = 0.063) (Table 2). The standardized within-subject effect size was large in magnitude (Cohen's dz = -2.00), reflecting consistent score reductions across participants rather than a single outlier-driven change.

Table 1. Individual DASS-21 Depression Scores Pre- and Post-CBT (Eligible Participants; Baseline ≥ Mild, n=5)

Participant	Baseline score	Baseline category	Post score	Post category	Change (Post–Baseline)	% Change
1	8	Moderate	5	Mild	-3	-37.5%
3	5	Mild	4	Normal	-1	-20.0%
4	10	Moderate	7	Moderate	-3	-30.0%
5	6	Mild	4	Normal	-2	-33.3%
6	7	Moderate	6	Mild	-1	-14.3%

Table 2. Pre–Post Change Summary and Inferential Statistics (Eligible Participants; n=5)

Outcome	Baseline	Post	Mean change (Post–Baseline)	95% CI for mean change	Cohen's d	Paired t-test (t, p)	Wilcoxon (W, p)
DASS-21 Depression score	7.2 ± 1.9	5.2 ± 1.3	-2.0	-3.24 to -0.76	-2.00	-4.47, 0.011	0, 0.063

Table 3. Change by Baseline Severity Category (Eligible Participants; n=5)

Baseline category	n	Mean change (Post–Baseline)	Median change
Mild (5–6)	2	-1.5	-1.5
Moderate (7–10)	3	-2.33	-3.0

Severity-category interpretation showed clinically meaningful downward shifts. Both participants starting in the mild range moved into the normal range after CBT (2/2; 100%), while among those starting in the moderate range, two shifted to mild (2/3; 66.7%) and one remained moderate despite a 3-point reduction (1/3; 33.3%) (Table 1). Mean change was numerically greater among those with moderate baseline severity (-2.33) than mild baseline severity (-1.5), although subgroup comparisons are descriptive given the very small cell sizes (Table 3).

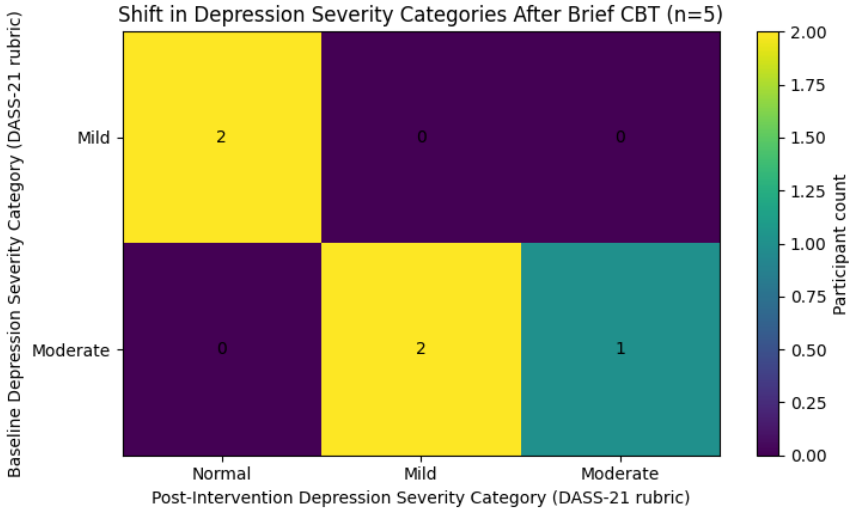

Figure 1. Severity-Category Transitions from Baseline to Post-Intervention

The severity-transition matrix demonstrates that 4/5 participants (80%) improved by at least one categorical level following the brief CBT program, including 2/2 participants (100%) who moved from mild to normal and 2/3 participants (66.7%) who moved from moderate to mild. One participant (20%) remained in the moderate category despite a 3-point reduction in score (10 to 7), indicating symptomatic improvement that did not cross the predefined severity threshold. Overall, the pattern indicates a net shift away from moderate severity (baseline: 3/5; post: 1/5) with a corresponding increase in normal-range classification (baseline: 0/5; post: 2/5), supporting a clinically interpretable downward severity gradient after the intervention.

DISCUSSION

In this feasibility-oriented single-arm pre–post evaluation, depressive symptom severity decreased after a brief five-session CBT program delivered over two months. Across eligible participants, the average DASS-21 depression score declined by 2.0 points with a large within-subject standardized effect, and 80% of participants improved by at least one severity category, including two transitions from mild to normal and two transitions from moderate to mild. Although these within-participant reductions are consistent with the broader evidence base supporting CBT as an effective approach for depressive symptoms, the present findings should be interpreted as preliminary because the design cannot separate treatment effects from non-specific influences such as expectancy, spontaneous symptom fluctuation, assessment reactivity, and regression to the mean (7,17).

The severity-transition pattern provides clinically interpretable nuance beyond mean change. Participants starting in the mild range improved into the normal range, whereas those starting in the moderate range showed heterogeneous outcomes: two shifted to mild and one remained moderate despite a 3-point reduction that did not cross the category threshold. This gradient aligns with clinical expectations that baseline severity and clinical complexity can influence response trajectories, while also reinforcing that categorical thresholds may be less sensitive to meaningful improvement near cut-points. The structured and time-limited nature of CBT is designed to target maladaptive cognitions and behaviors through skill acquisition and practice, and the consistency of improvement across individuals supports the plausibility of a true therapeutic signal even in brief formats (6,7). At the same time, psychotherapy outcome research suggests a dose–response relationship in which additional sessions may yield greater efficacy, indicating that extending session number or treatment duration may increase the proportion of participants who achieve full category shifts, particularly among those with higher baseline severity (9).

From an implementation perspective, brief CBT formats may be attractive in settings where depression remains under-recognized or variably diagnosed and where time and workforce constraints limit access to longer psychotherapy courses (3,4). A feasible, structured intervention that yields measurable symptom reductions could therefore support pragmatic service delivery, but stronger causal inference requires a controlled design. Future work should employ a randomized comparison group and prespecify endpoints and follow-up timing, incorporate rigorous fidelity monitoring to ensure CBT is delivered as intended, and consider measuring comorbid symptom dimensions given the high prevalence and prognostic relevance of mixed anxiety–depression presentations in real-world populations (11). Adding follow-up assessments would also clarify durability of benefit and relapse prevention effects, which are central to CBT's intended long-term impact (6,7).

Several limitations constrain interpretation. The sample was small, limiting precision and making p-values sensitive to assumptions; this is reflected by the divergence between exploratory parametric and nonparametric results despite the same direction of change. The absence of a control group prevents attribution of causality, and the short post-intervention assessment window does not establish maintenance of gains. Measurement relied on self-report symptom scoring without an embedded validity scale, and broader clinical characterization (including standardized screening for bipolar disorder, active suicidality, or concurrent treatment changes) should be strengthened in subsequent studies to improve internal validity and safety characterization. Finally, the brief intervention schedule may not be sufficient for some participants to achieve category-level remission, supporting the recommendation to increase treatment "dose" in larger follow-up studies (9).

CONCLUSION

A brief five-session CBT program was associated with reduced depressive symptom scores and downward shifts in severity categories in most eligible participants, suggesting potential feasibility and benefit as a short-format intervention; however, due to the small sample size and uncontrolled pre–post design, these findings should be considered preliminary and best used to justify a larger, controlled study with prespecified outcomes, fidelity monitoring, and follow-up to confirm effectiveness and durability (7,17).

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