Comparative Effectiveness of Face-to-Face Cognitive-Behavioral Therapy and Combined Cognitive-Behavioral Therapy (Face-to-Face + Web-Based Application) on Maladaptive Perfectionism in College Students: A Randomized Controlled Trial

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Abstract

Background: The effectiveness of integrating a self-help training application with cognitive behavioral therapy (CBT) for treating maladaptive perfectionism remains unclear. This study evaluated the impact of combining CBT with a web-based program versus CBT alone on psychological outcomes in college students with maladaptive perfectionism.

Methods: This study involved 52 participants randomized to a 10-week intervention of either CBT or CBT combined with a web-based application. Outcomes assessed included perfectionism, depression, anxiety, stress, psychological well-being, procrastination, and life satisfaction, measured through self-reporting at baseline, posttreatment, and 3 follow-ups. Data analyses utilized independent t tests, chi-square tests for preintervention differences, and repeated mixed analysis of variance (ANOVA) to evaluate intervention effects over time, with effect sizes calculated using η^2.

Results: Participants had a mean age of 27.85 years (SD, 4.94), were predominantly female (n = 34; 74%), mostly single (n = 29; 73.9%), and held a master's degree (n = 20; 43.5%). Overall, 52 participants were randomized into 2 groups, with 26 participants in each group. Of these, 23 participants from each group completed the treatment and follow-up periods. The CBT combined with an App group demonstrated superior effectiveness in addressing perfectionism and improving interpersonal sensitivity, striving for excellence, and high standards for others compared with CBT alone. In addition, this combined treatment was significantly better than CBT in reducing stress, increasing psychological well-being, and improving life satisfaction.

Conclusion: Integrating a web-based self-help application with CBT effectively reduces maladaptive perfectionism and associated psychopathology, highlighting the potential benefits of combining digital tools with traditional therapeutic approaches.

Keywords: Cognitive-Behavioral Therapy, Maladaptive Perfectionism, Students, Application, Iran

Introduction

Perfectionism is categorized into 2 types: adaptive (normal) and maladaptive (neurotic) (1, 2). Adaptive perfectionism is a healthy form characterized by setting high personal standards and goals while still appreciating one's achievements (3). In contrast, maladaptive perfectionism is characterized by excessively high-performance expectations and harsh self-criticism, which leads to psychological distress and impaired academic performance of students (4-7).

Cognitive behavioral therapy (CBT) is widely recognized

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↑What is "already known" in this topic:
Cognitive behavioral therapy (CBT) is recognized as an effective treatment for maladaptive perfectionism, helping individuals manage their perfectionistic tendencies and associated psychological distress.

→What this article adds:
Combining self-help applications with traditional therapeutic approaches can provide a more comprehensive treatment strategy for individuals struggling with maladaptive perfectionism.

as a validated intervention for maladaptive perfectionism (8). However, exclusive reliance on CBT may yield incomplete therapeutic outcomes. During therapy, students may suppress their feelings due to shame and hide the truth for fear of the potential consequences of disclosure.

Consequently, integrating complementary strategies alongside CBT is essential to enhance treatment efficacy (9). One promising method involves the use of web-based applications, which facilitates access to therapeutic resources at any time and from any location, thereby promoting greater engagement with the treatment process (10).

Research on the effectiveness of web-based applications as an adjunctive therapy in clinical settings is limited, primarily comparing these tools to control groups receiving no treatment (11, 12). This study aimed to investigate the effectiveness of a combined web-based application and CBT (CBT+App) versus CBT alone in improving maladaptive perfectionism, depression, anxiety, stress, psychological well-being, procrastination, and life satisfaction in university students with maladaptive perfectionism.

Methods

The present study utilized an unblinded randomized clinical trial (RCT) design to compare the outcomes of 2 parallel intervention groups during the preintervention, postintervention, and follow-up periods.

1. Study Setting and Eligibility Criteria

Sampling was conducted from September 23, 2023, to December 7, 2023, at 2 counseling and therapeutic treatment centers in Tehran, Iran, utilizing a convenience sampling approach. The inclusion criteria were students aged 18 to 35 years who demonstrated a willingness to participate in the study, had access to the internet and a smartphone, and scored >174 on Hill's questionnaire (13). The exclusion criteria included individuals with psychotic symptoms, autism spectrum disorder, bipolar disorder, substance-related disorders, those taking psychiatric medications, individuals experiencing serious suicidal ideation, and participants engaged in other psychotherapeutic interventions. The evaluation of exclusion criteria for individuals was conducted using a structured clinical interview based on the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition. Finally, participants were removed from the study if they discontinued treatment, missed >2 sessions, or did not use the application for >2 sessions.

2. Procedures

Participants who met eligibility criteria were invited to participate in the study and complete the informed consent process. Randomization was conducted in blocks of 4 to achieve balanced participant allocation across treatment groups, utilizing Excel for precise implementation. Prequestionnaires were emailed to participants, and after receiving the completed questionnaires, they were randomly assigned in a 1 to 1 ratio using a computer sequence to receive 10 weeks of CBT + App or CBT alone treatment (Figure 1). For participants assigned to the CBT + App group therapy, the application link was provided via WhatsApp,

Telegram, or email, along with comprehensive explanations about its use. Both groups completed questionnaires at baseline (T1), at the end of the 10th week (posttreatment, T2), and again after the 22nd week (3-month follow-up, T3).

3. Intervention

In this study, we employed the treatment protocol developed by Egan et al for cognitive-behavioral therapy in 2014. This protocol is based on Beck's cognitive therapy and Ellis's rational-emotive therapy, focusing on identifying and modifying maladaptive thought patterns. By integrating these frameworks, the protocol effectively addresses cognitive distortions and emotional responses (14). Participants in both groups underwent 10 individual therapy sessions each week, each lasting 45 minutes. For the combined group, participants received a self-help training application and the previously mentioned treatment. This application is based on the protocol developed by Egan (14) and Shafran (15), prepared with the opinions of clinical psychology experts. It was then designed by specialists in programming and application development. This web-based application provided participants with 10 training sessions—including videos, diagrams, written content, questions, and practice exercises. Participants were encouraged to review the application content for each session and complete the relevant assignments between their treatment sessions.

4. Outcomes
Primary Outcomes
Perfectionism

Perfectionism was evaluated using the Hill Perfectionism Questionnaire (HPQ), a self-report instrument consisting of 58 items (13). Participants rated each item on a 5-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree). The HPQ assesses 6 domains—interpersonal sensitivity, striving for excellence, organization, perceived parental pressure, purposefulness, and high standards for others. The scoring range of this questionnaire is from a minimum of 58 to a maximum of 290. Higher total scores indicate greater maladaptive perfectionism. The Persian version of the HPQ demonstrated strong psychometric properties, with a Cronbach's alpha of 0.93, and confirmed internal validity by experts (16).

Secondary Outcomes
Depression, Anxiety, and Stress

The Depression, Anxiety, and Stress Scales (DASS) is a widely recognized self-report instrument designed to assess the levels of depression, anxiety, and stress in individuals (17). This instrument comprises 42 items, categorized into 3 subscales: 14 items for depression, 14 for anxiety, and 14 for stress. Participants rated each item on a 4-point Likert scale, reflecting how much the statement applied to them over the past week, with response options ranging from 0 (Did not apply to me at all.) to 3 (Applied to me always.). The scoring range for each subscale of this questionnaire is from a minimum of 0 to a maximum of 42. Higher total scores indicate greater depression, anxiety, and stress. The Iranian sample demonstrated the validity and reliability of
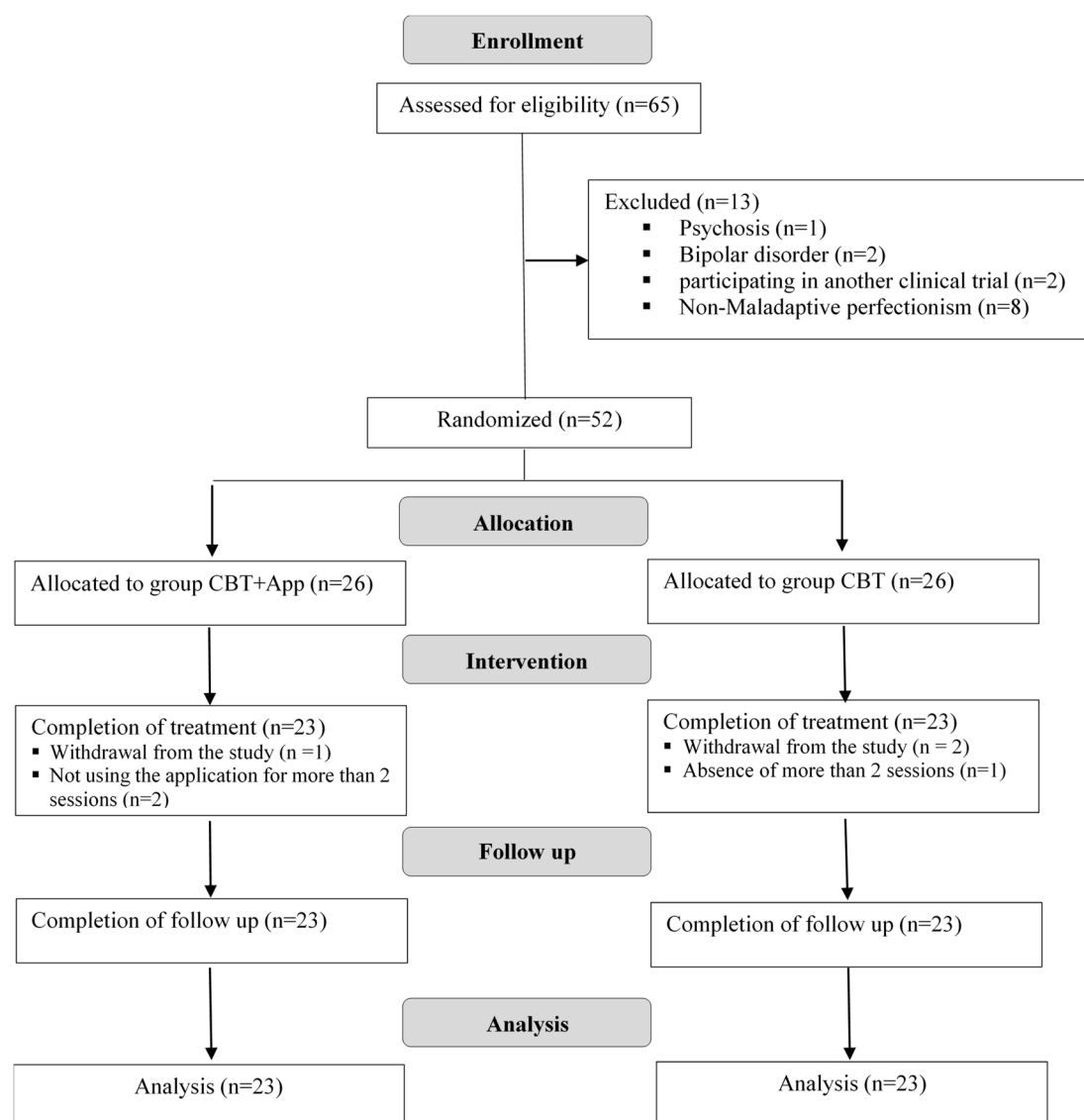
Figure 1. Participant flow through the trial

the Persian DASS version. The depression scale correlated with the Beck Depression Inventory at 0.849, the anxiety scale with the Zung Anxiety Test at 0.831, and the stress scale with the Students Stress Inventory at 0.757. Cronbach's alpha coefficients were 0.94 for depression, 0.85 for anxiety, and 0.87 for stress (18).

Psychological Well-being

The Riff Questionnaire (18 items), developed in 1995, was used to assess participants' psychological well-being (19). This instrument comprises 18 items on a Likert scale from 1 (strongly disagree) to 6 (strongly agree). It is important to note that some items are scored inversely. The scoring range of this questionnaire is from a minimum of 18 to a maximum of 108. Higher total scores indicate greater psychological well-being. The Persian version of the Riff Questionnaire demonstrated satisfactory psycho-

metric properties. The internal consistency of this scale, assessed using Cronbach's alpha, was measured across 6 factors—self-acceptance (0.51), environmental control (0.76), positive relationships with others (0.75), purpose in life (0.52), personal growth (0.73), and independence (0.72) (20).

Procrastination

The Tuckman Procrastination Scale, comprising 16 items, was utilized to assess procrastination levels. Respondents rated their agreement with each statement on a Likert scale ranging from 1 (strongly disagree) to 4 (strongly agree), with certain items scored inversely. The scoring range of this questionnaire is from a minimum of 16 to a maximum of 64. Higher total scores reflect a stronger tendency to procrastinate. The validity of the Persian version of the questionnaire was confirmed by expert reviews, and its reliability was assessed using Cronbach's

alpha, which yielded a value of 0.71 (21).

Life Satisfaction

The scale comprised a single question: "How do you evaluate your life these days?" Responses ranged from 0, representing the worst possible situation, to 10, indicating the best possible situation. Sharifi-Fard illustrated that the reliability score of the retest of the single-question life satisfaction scale was 0.74, with convergent validity of 0.61 for psychological well-being, and divergent validity scores of –0.36 and –0.53 for anxiety and depression, respectively, which are considered desirable (22).

5. Sample Size

The sample size for this study was determined by the primary outcome of interest: maladaptive perfectionism. An alpha level of .05 and a statistical power of 95% were utilized to identify a small effect size difference between groups (Cohen's f = 0.25). Considering a dropout rate of 15%, the GPower program indicated that a 26 participants per group was necessary.

6. Data Analyses

We employed independent t tests for continuous variables and the chi-square test for categorical variables to assess pretest differences in demographic and outcome measures between the 2 groups. To investigate the impact of the intervention on all outcome measures, repeated mixed 2-way analysis of variance (ANOVA) was conducted, with time as the within-subject factor (T1, T2, T3) and group as the between-subject factor (CBT, CBT + App). Effect sizes were calculated using η^2, with the following thresholds: $\eta^2 = 0.01$ for small effects, $\eta^2 = 0.06$ for medium effects, and $\eta^2 = 0.14$ for large effects. The assumptions of mixed ANOVA were verified using the Shapiro-Wilk test for normality, Levene's test for homogeneity of variances, and Mauchly's test for sphericity. When the sphericity assumption was not met, Greenhouse–Geisser corrections were applied. Moreover, we conducted post-hoc tests with Bonferroni adjustment to evaluate the mean differences (d) between T2-T1 and T3-T1 across the 2 groups. All statistical analyses were conducted using SPSS 24, with a significance level set at .05.

Results

Demographic Characteristics and Outcome Indicators at Baseline

The mean age of participants was 27.85 years (SD, 4.94). The majority identified as women (74%), single (73.9%), and having a master's degree (43.5%). There were no significant differences between groups in demographic and outcome variables at pretreatment (Table 1).

Changes in Primary Outcome From Baseline (T1) to Posttreatment (T2) and 3-Month Follow-up (T3)

The intervention led to a significant reduction in perfectionism across both intervention groups over time, with a large effect size [$F_{(1.31, 57.86)} = 160.28$; $P < 0.001$; $\eta^2 = 0.78$]. Notably, the CBT + App group exhibited a significantly greater improvement in perfectionism compared with the CBT group, indicated by a substantial effect size [$F_{(1, 44)} = 5.97$; $P = 0.01$; $\eta^2 = 0.12$] (Table 2). At T2, the CBT + App intervention resulted in a statistically significant reduction in perfectionism scores, with a mean decrease of 27.13 points, in contrast to the CBT group, which exhibited a reduction of 16.30 points. By T3, the CBT +

Table 1. Comparison of baseline characteristics between groups

	Groups		
	CBT (n=23) mean (SD)	CBT+App (n=23) mean (SD)	Statistical test(df), p
Demographic Variable			
Age,	28.04 (4.86)	27.65 (5.13)	t(44) =0.26, p=0.390
Sex, n (%)			
Male	5 (21.7)	7 (30.4)	χ²(1) =0.45, p=0.501
Female	18 (78.3)	16 (69.6)	
Marital Status, n (%)			
Single	15 (65.2)	14 (60.9)	χ²(1) =0.09, p=0.764
married	8 (34.8)	9 (39.1)	
Education, n (%)			
Bachelor	6 (26.1)	6 (26.1)	χ²(2) =0.48, p=0.781
Master	9 (39.1)	11(47.8)	
Doctorate	8 (34.8)	6 (26.1)	
Outcome Variables			
Perfectionism	202.39 (13.26)	201.83 (11.55)	t(44) =0.15, p=0.870
Interpersonal sensitivity	68.91 (6.09)	67.04 (6.58)	t(44) =0.99, p=0.321
Striving for excellence	25.43 (2.08)	25.30 (2.42)	t(44) =0.19, p=0.844
Organization	23.91(2.44)	24.65(3.08)	t(44) =-0.90, p=0.377
Perceived parental pressure	25.52 (2.89)	25.61 (3.01)	t(44) =-0.10, p=0.926
Purposefulness	27.48 (2.59)	28.65 (2.69)	t(44) =-1.50, p=0.139
High standards for others	31.13 (2.41)	30.57 (1.80)	t(44) =-0.89, p=0.375
Stress	24.48 (4.85)	24.23 (6.91)	t(44) =0.19, p=0.842
Anxiety	23.70 (4.43)	23.35 (4.44)	t(44) =0.26, p=0.791
Depression	21.70 (3.35)	22.13 (6.09)	t(44) =-0.30, p=0.763
Psychological well-being	57.39 (7.14)	58.61 (6.35)	t(44) =-0.61, p=0.543
Procrastination	42.57 (6.02)	43.47 (5.87)	t(44) =-0.66, p=0.502
Life satisfaction	5.13 (0.81)	5.35 (0.93)	t(44) =-0.84, p=0.406

Table 2. Primary and secondary outcome measures over time

Outcome Variables	Time			Group			Group * Time		
	F(df)	p	η²	F(df)	p	η²	F (df)	p	η²
Perfectionism	F(1.31, 57.86)=160.28	<0.001	0.78	F(1,44)=5.97	0.010	0.12	F(1.31, 57.86)=9.83	0.001	0.18
Interpersonal sensitivity	F(1.48, 65.45)=40.23	<0.001	0.47	F(1,44)=9.26	0.004	0.17	F(1.48, 65.45)=1.60	0.213	0.03
Striving for excellence	F(1.65, 72.60)=68.63	<0.001	0.60	F(1,44)=4.86	0.030	0.09	F(1.65, 72.60)=2.22	0.125	0.04
Organization	F(1.69, 74.75)=26.31	<0.001	0.37	F(1,44)=1.60	0.212	0.03	F(1.69, 74.75)=2.53	0.093	0.05
Perceived parental pressure	F(1.57, 69.39)=45.78	<0.001	0.51	F(1,44)=3.09	0.085	0.06	F(1.57, 69.39)=1.22	0.291	0.02
Purposefulness	*F(2, 88)=36.01	<0.001	0.45	F(1,44)=1.85	0.181	0.04	*F(2, 88)=6.61	0.002	0.13
High standards for others	*F(2, 88)=29.35	<0.001	0.40	F(1,44)=8.98	0.004	0.16	*F(2, 88)=3.06	0.051	0.06
Stress	F(1.15, 50.83)=189.09	<0.001	0.81	F(1,44)=4.40	0.041	0.09	F(1.15, 50.83)=3.62	0.052	0.07
Anxiety	F(1.43, 63.07)=318.76	<0.001	0.87	F(1,44)=3.74	0.052	0.07	F(1.43, 63.07)=1.74	0.192	0.03
Depression	F(2, 88)= 64.98	<0.001	0.59	F(1,44)=0.14	0.706	0.003	*F(2, 88)=1.99	0.145	0.04
Psychological well-being	F(1.51, 66.55)= 214.24	<0.001	0.83	F(1,44)= 4.70	0.033	0.09	F(1.51, 66.55)= 10.21	<0.001	0.18
Procrastination	F(1.34, 58.94)= 111.35	<0.001	0.71	F(1,44)= 0.24	0.621	0.005	F(1.34, 58.94)= 2.80	0.082	0.06
Life satisfaction	*F(2, 88)= 45.77	<0.001	0.51	F(1,44)= 4.62	0.036	0.09	F(2, 88)= 0.39	0.673	0.009

*Greenhouse-Geisser correction

App group sustained a notable reduction of 30.43 points in perfectionism (mean difference from baseline, –30.43 [95% CI, –23.19 to –37.67]), whereas the CBT group demonstrated a decrease of 18.39 points (mean difference from baseline, –18.39 [95% CI, –12.38 to –24.39]) (Table 3, Appendix Figure 1).

All domains of perfectionism demonstrated significant improvement over time in both groups. The CBT + App intervention exhibited superior effects in interpersonal sensitivity [F (1, 44) = 9.2; P = 0.004; η² = 0.17], striving for excellence [F(1, 44) = 4.86; P = 0.03; η² = 0.09], and high standards for others [F(1, 44) = 8.98; P = 0.004; η² = 0.16] compared with the CBT-only group (Table 2). In this manner, the CBT + App intervention resulted in significant reductions in interpersonal sensitivity scores, decreasing by 7.04 at T2 and 8.00 at T3. Additionally, scores for striving for excellence dropped by 4.60 at T2 and 4.95 at T3, while high standards for others decreased by 3.69 at T2 and 3.78 at T3 (Table 3, Appendix Figure 2). Although no significant difference was observed between the 2 intervention groups in terms of purposefulness score reduction, the efficacy of the interventions differed at various time intervals [F (2, 88) = 6.61; P = 0.002; η² = 0.13] (Table 2).

Changes in Secondary Outcomes From Baseline (T1) to Posttreatment (T2) and 3-Month Follow-up (T3)

Both intervention groups demonstrated a significant improvement over time, exhibiting a large effect size across measures of stress, anxiety, depression, psychological well-being, procrastination, and life satisfaction (Table 2). Notably, the CBT + App group exhibited superior improvements compared with the alternative intervention group, achieving a medium effect size in stress [F (1, 44) = 4.40; P = 0.04; η² = 0.09], psychological well-being [F (1, 44) = 4.70; P = 0.03; η² = 0.09], and life satisfaction [F (1, 44) =

4.62; P = 0.03; η² = 0.09], as detailed in Table 2. The CBT + App significantly reduced stress by 11.56 points (mean difference, –11.56 [95% CI, –8.61 to –14.5]) at T2 and 12.52 at T3 (mean difference, –12.52 [95% CI, –9.20 to –15.83]). Psychological well-being scores increased by 11.56 and 12.30, while life satisfaction improved by 1.30 and 1.26. In comparison, The CBT group experienced significant reductions in stress scores of 8.87 (mean difference, –8.87 [95% CI, –6.73 to –11]) and 9.39 (mean difference, –9.39 95% CI, –6.96 to 11.82]) T2 and T3, respectively. Additionally, psychological well-being scores increased by 7.34 and 7.95, while life satisfaction scores rose by 1.08 and 1.04 (Table 3).

Discussion

The results demonstrated that CBT significantly improves all measured outcomes— including perfectionism, stress, anxiety, depression, psychological well-being, procrastination, and life satisfaction. Notably, when CBT is combined with a mobile application, its effectiveness in addressing perfectionism is greatly enhanced, particularly in areas such as interpersonal sensitivity, striving for excellence, and high standards for others. Additionally, this combined treatment is significantly more effective at reducing stress, enhancing psychological well-being, and improving overall life satisfaction than CBT alone.

Numerous studies have proven the significant impact of CBT on maladaptive perfectionism. Ricky Galloway's systematic review found large effect sizes for CBT in addressing perfectionism, specifically worry about mistakes (g = 0.89) and clinical perfectionism (g = 0.87), as well as moderate effect sizes for personal standards of perfectionism (g = 0.57) (23). Egan et al (2011) provide compelling evidence that CBT reduces not only self-centered perfectionism but also socially prescribed perfectionism (24). The findings

Table 3. Post hoc tests to compare three assessment scores across groups

Outcome Variables	Time	Mean (SD)		*Mean difference from baseline (95% CI)	
		CBT	CBT+App	CBT	CBT+App
Perfectionism	Post-treatment	186.09 (11.63)	174.70 (14.24)	-16.30 (-11.29 to -21.31)	-27.13 (-20.13 to -34.12)
	Follow-up	184 (12.62)	171.39 (13.16)	-18.39 (-12.38 to -24.39)	-30.43 (-23.19 to -37.67)
Interpersonal sensitivity	Post-treatment	64.48 (3.84)	60 (4.74)	-4.43 (-1.65 to -7.21)	-7.04 (-2.75 to -11.33)
	Follow-up	63.35 (4.44)	59.04 (4.13)	-5.56 (-2.79 to -8.33)	-8 (-4.61 to -11.38)
Striving for excellence	Post-treatment	22.09 (1.73)	20.70 (2.07)	-3.34 (-2.15 to -4.54)	-4.60 (-3.53 to -5.68)
	Follow-up	22.09 (3.01)	20.35(2.22)	-3.34 (-1.40 to -5.29)	-4.95 (-3.45 to -6.45)
Organization	Post-treatment	22 (2.15)	21.83 (1.99)	-1.91(-0.27 to -3.55)	-2.82 (-1.12 to -4.53)
	Follow-up	22.13 (2.30)	21.04 (2.65)	-1.78 (-0.59 to -2.96)	-3.60 (-1.69 to -5.52)
Perceived parental pressure	Post-treatment	22.22 (2.55)	20.96 (1.98)	-3.30 (-1.42 to -5.18)	-4.65 (-2.61 to -6.69)
	Follow-up	22.13 (1.71)	20.96 (2.05)	-3.39 (-1.60 to -5.17)	-4.65 (-2.44 to -6.86)
Purposefulness	Post-treatment	26.04 (2.83)	24.35 (2.62)	-1.43 (0.12 to -2.99)	-4.30 (-2.10 to -6.08)
	Follow-up	25.13 (2.36)	23.17 (3.46)	-2.34 (-0.49 to -4.20)	-5.47 (-3.31 to -7.64)
High standards for others	Post-treatment	29.26 (2.97)	26.87 (3.07)	-1.78 (-0.30 to -3.43)	-3.69 (-2.10 to -5.28)
	Follow-up	29.17 (2.34)	26.78 (2.86)	-1.95 (-0.39 to -3.52)	-3.78 (-2.40 to -5.52)
Stress	Post-treatment	15.61 (3.47)	12.57 (3.50)	-8.87 (-6.73 to -11)	-11.56 (-8.61 to -14.5)
	Follow-up	15.09 (3.31)	11.61(3.44)	-9.39 (-6.96 to 11.82)	-12.52 (-9.20 to -15.83)
Anxiety	Post-treatment	13.83 (2.55)	11.61 (2.36)	-9.87 (-7.97 to -11.76)	-11.73 (-10.12 to -13.35)
	Follow-up	12.13 (3.07)	10.26 (2.30)	-11.56 (-9.70 to -13.42)	-13.07 (-11.30 to -14.87)
Depression	Post-treatment	18.70 (3.63)	17.65 (4.59)	-3 (-1.43 to -4.56)	-4.47 (-3.14 to -0.5.81)
	Follow-up	18.26 (3.27)	17.48 (4.66)	-3.45 (-1.93 to -4.93)	-4.65 (-3.03 to -6.27)
Psychological well-being	Post-treatment	64.74 (7.47)	70.17 (6.06)	7.34 (9.34 to 5.35)	11.56 (9.12 to 14.00)
	Follow-up	65.35 (7.38)	70.91 (5.67)	7.95 (10.09 to 5.81)	12.30 (9.82 to 14.78)
Procrastination	Post-treatment	36.13 (3.22)	34.61 (4.18)	-6.43 (-3.71 to -9.15)	-9.13 (-6.72 to -11.53)
	Follow-up	35.22 (4)	33.87 (3.64)	-7.34 (4.42 to -10.26)	-9.87 (-7.12 to -12.61)
Life satisfaction	Post-treatment	6.22 (0.67)	6.65 (0.83)	1.08 (0.57 to 1.60)	1.30 (0.33 to 1.77)
	Follow-up	6.17 (0.83)	6.61 (0.65)	1.04 (0.46 to 1.61)	1.26 (0.71 to 1.80)

*Mean difference of Post-treatment –baseline and follow-up -baseline

from LaSota, Handley, and Arana reinforce the notion that group interventions based on CBT can also lead to substantial improvements in maladaptive perfectionism (25-27). CBT effectively facilitates cognitive restructuring techniques that challenge unrealistic standards and negative self-evaluations. By encouraging individuals to reframe their perceptions of success and failure, CBT fosters a more balanced self-view. This therapeutic process significantly reduces the fear of making mistakes, allowing individuals to embrace imperfection and cultivate a healthier relationship with their own self-worth. Ultimately, the application of CBT not only enhances emotional resilience but also promotes personal growth and self-acceptance (28). Furthermore, CBT has emerged as a powerful tool for addressing psychological disorders related to maladaptive perfectionism. A comprehensive review of meta-analyses indicates that there is robust support for the efficacy of CBT in treating anxiety disorders (29). A case series study by Chand et al (2016) found that medical students with maladaptive perfectionism experienced positive and lasting reductions in stress after CBT (30). An RCT assessed the effectiveness of CBT for Jordanian university students with moderate to severe depressive symptoms. Three months postintervention, those receiving CBT reported significantly lower perceived stress and depressive symptoms, along with reduced avoidance coping strategies and increased approach coping strategies compared with the no-treatment group (31). Mahmoodi's findings show CBT, which prioritizes emotion regulation, is more effective than CBT focused on perfectionism for people with dysfunctional perfectionism who suffer from depression and anxiety (32). This evidence suggests that CBT changes negative thought patterns and enables people to better manage their emotional responses and improve their overall mental health. Notably, perfectionism often leads to passive procrastination (33, 34); however, addressing perfectionism can significantly reduce this tendency by improving time management and self-regulation skills (35, 36). Our findings suggest that perfectionists experienced improvements in psychological well-being and quality of life after CBT, consistent with Handley's study (26). Conversely, Butt's research in Pakistan indicated that individuals with high scores in personal standards, parental expectations, and organization reported elevated psychological well-being (37).

Additionally, Park et al found no significant differences in psychological well-being or life satisfaction between adaptive perfectionists and nonperfectionists (38). Sonam's evaluation of a brief CBT-based perfectionism workshop demonstrated that participants' well-being deteriorated over an 11-week follow-up period (39). These findings highlight the complex relationship between perfectionism and psychological well-being and life satisfaction, suggesting that individual differences may mediate the effectiveness of CBT.

To the best of our knowledge, there are limited studies directly comparing the 2 interventions, CBT and CBT supplemented with mobile applications, while the majority of existing research focuses on comparisons between web-based CBT and either control groups or face-to-face CBT. A meta-analysis by Galloway et al (2022) found that self-help CBT significantly outperformed waitlist or control groups in addressing perfectionism, showing medium to large effect sizes: personal standards (g = 0.56), concern over mistakes (g = 0.83), and clinical perfectionism (g = 0.91). Additionally, there were small to medium effect sizes for anxiety (g = 0.43) and depression (g = 0.48) (23). Another meta-analysis (2011) highlighted the effectiveness of CBT-based guided self-help (GSH) interventions for anxiety and depressive disorders at posttreatment. However, the GSH demonstrated limited effectiveness at the follow-up and among clinically representative samples. The analysis also noted that studies reporting greater GSH effectiveness often had lower methodological quality and involved self-selected participants rather than those recruited through clinical referrals. These findings suggest that the GSH may have limited applicability in routine clinical practice (40). A study with 156 participants found that an 8-week internet-based CBT resulted in moderate to large effect sizes on the Frost Multidimensional Perfectionism subscales, with Cohen's d ranging from 0.68 to 1 (95% CI, 0.36-1.33). The treatment group showed significantly higher odds of improvement compared with the control group (odds ratio, 6.24 [95% CI, 2.73- 14.25). These results indicate that ICBT effectively addresses clinical perfectionism, although further research on its long-term benefits is necessary (41). Rozental et al suggest that internet-based CBT with guidance from a therapist could help individuals manage and overcome their perfectionism in the long term (42). This finding emphasizes the importance of integrating technology into mental health interventions, as it may facilitate more comprehensive therapeutic benefits for individuals struggling with perfectionism and related psychological issues.

Limitations

This study has several limitations. The sample was exclusively drawn from 2 counseling centers in Tehran, which restricts generalizability. Additionally, the focus on participants aged between 18 and 35 years limits applicability to other age groups. Data collection relied on self-reports, potentially affecting accuracy. Furthermore, a longer follow-up period is necessary to evaluate the long-term effects.

Conclusion

The study's findings advocate for the continued exploration of hybrid treatment models that combine traditional cognitive behavioral therapy with web-based tools. The sustained improvements observed in the CBT + WEB group suggest that such interventions could provide lasting benefits for individuals with perfectionism.

Authors' Contributions

All authors played a significant role in the conception and design of the study. G.M. was responsible for data collection, statistical analysis, and the initial drafting of the manuscript. All authors participated in the review and editing process and approved the final version of the manuscript.

Ethical Considerations

The study received approval from the Ethics Committee of Iran University of Medical Sciences (IR.IUMS.REC.1397.1209) and was registered with the Iranian Registry of Clinical Trials (IRCT20231018059762N1). Informed consent was obtained from all participants after they were fully explained about the purpose of the study and the confidentiality of their data.

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Conflict of Interests

The authors declare that they have no competing interests.

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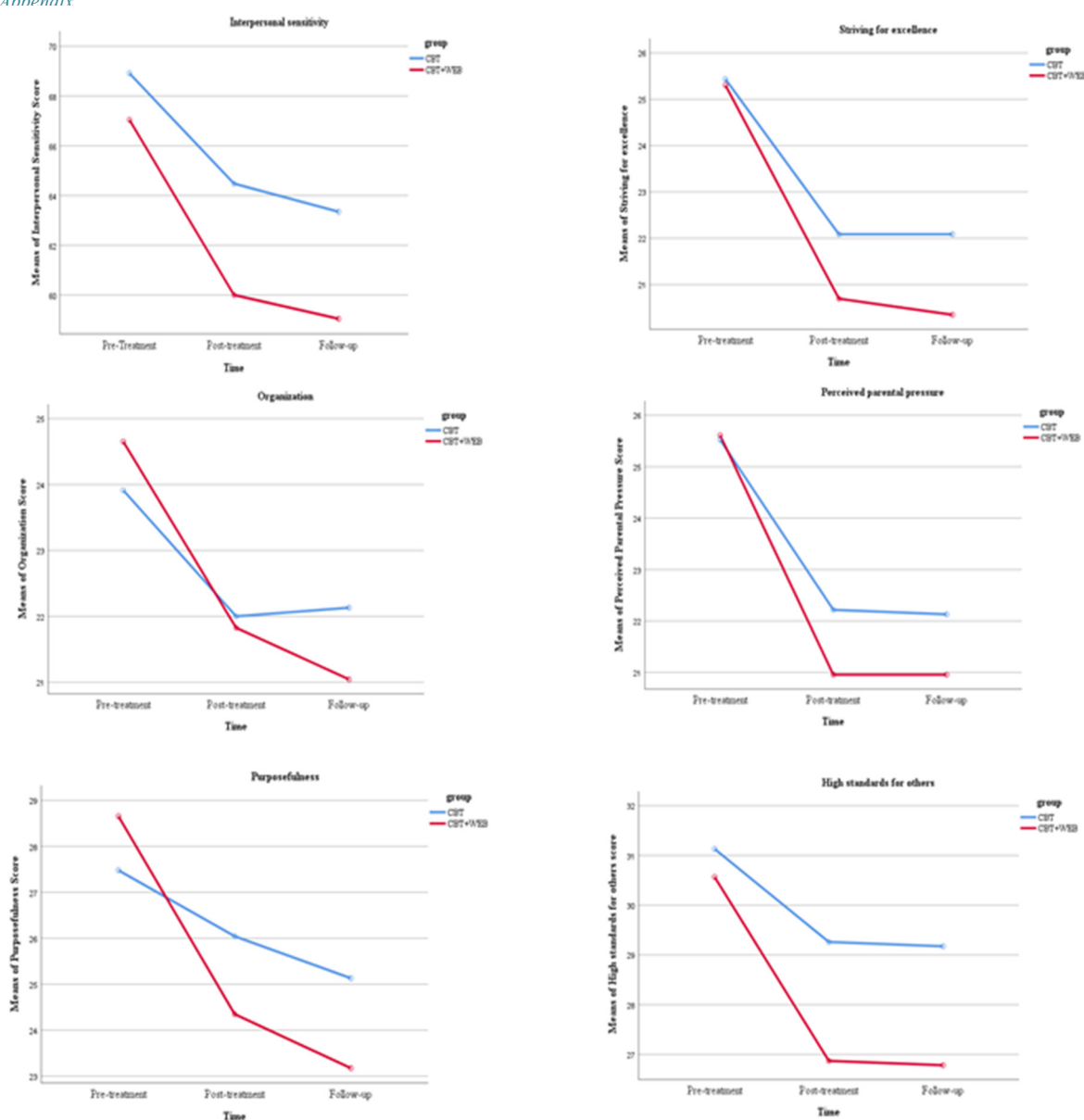
Appendix

Figure 1. Primary outcome: perfectionism and domains of perfectionism, at baseline, post-treatment and three-month follow-up
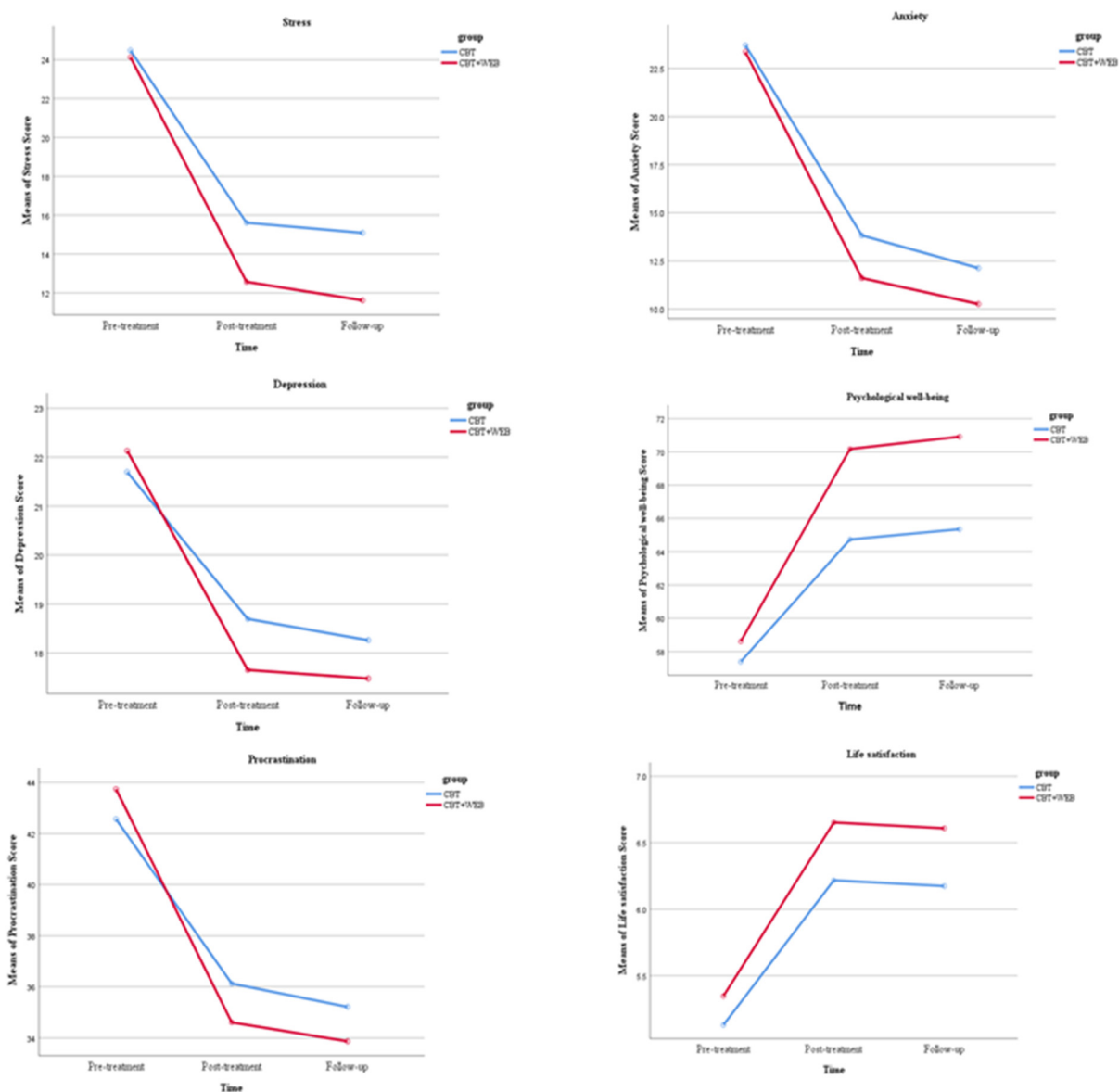
Figure 2. Secondary outcomes: Stress, Anxiety, Depression, Psychological well-being, Procrastination, and life satisfaction at baseline, post-treatment and three-month follow-up