# Comparison of the Effectiveness of Acceptance and Commitment Therapy and Unified Transdiagnostic Treatment on Cognitive Flexibility in Nurses with Post-Traumatic Stress Symptoms (PTSD) Caused by COVID-19 Infection

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## ABSTRACT

This study aimed to compare the effectiveness of Acceptance and Commitment Therapy (ACT) and Unified Transdiagnostic Treatment (UP) on cognitive flexibility in nurses with PTSD symptoms following COVID-19 infection. A quasi-experimental design with pre-test, post-test, and two-month follow-up was used on 30 nurses with PTSD symptoms based on the Keane PTSD questionnaire (cut-off score 107) working at Shahid Seyed Mostafa Khomeini Hospital in Tabas. Participants were randomly assigned to ACT, UP, or control groups (10 per group). The ACT and UP interventions consisted of eight weekly sessions following validated protocols. Cognitive flexibility was assessed using the Dennis and Vander Wal (2010) questionnaire, measuring perceived controllability, perceived justification of behavior, and alternative option generation. PTSD symptoms were measured by the Keane et al. (1988) questionnaire. Data analysis included descriptive statistics, ANCOVA, MANCOVA, and Bonferroni post hoc tests using SPSS-22. Results indicated significant differences among groups in all cognitive flexibility components at post-test and follow-up stages after controlling for pre-test scores ($p < .01$). The UP group showed significantly higher improvements than the ACT group in perceived controllability and generation of alternative options at both post-test and follow-up ($p < .01$). ACT also significantly outperformed the control group in all cognitive flexibility components ($p < .05$). Effect sizes ranged from moderate to large ($\eta^2 = .32–.55$), indicating clinically meaningful differences. Both ACT and UP effectively improved cognitive flexibility among nurses with PTSD symptoms, but UP demonstrated greater efficacy in enhancing perceived controllability and generation of alternative options. These findings support the use of UP as a robust transdiagnostic intervention to improve trauma recovery and adaptive functioning in professionals exposed to high occupational stress.

*Keywords: Acceptance and Commitment Therapy, Unified Protocol, Cognitive Flexibility, PTSD, Nurses, COVID-19.*

## 1. Introduction

The COVID-19 pandemic has profoundly impacted healthcare systems and professionals worldwide, exposing nurses in particular to sustained psychological stress and trauma. Among the psychological consequences of this crisis, Post-Traumatic Stress Disorder (PTSD) has emerged as a prominent mental health issue among frontline workers, including nurses who have endured prolonged exposure to critical illness, mortality, and occupational risk. PTSD is not only associated with intrusive memories, hyperarousal, and avoidance behaviors but is also linked with a marked decline in psychological adaptability and flexibility. Cognitive flexibility—the ability to shift thinking strategies and adapt behavior in response to changing situational demands—is particularly relevant to post-trauma recovery, yet often impaired in PTSD-affected individuals (Faustino, 2020). Addressing the deterioration in cognitive flexibility is thus a vital component in the therapeutic treatment of trauma-exposed healthcare professionals.

One approach to enhancing psychological flexibility and addressing trauma-related rigidity in thinking is Acceptance and Commitment Therapy (ACT), which is part of the so-called "third wave" of behavioral therapies. ACT emphasizes mindfulness, cognitive defusion, values clarification, and committed action, all of which are aimed at increasing psychological flexibility and reducing experiential avoidance (Levin et al., 2024). Research has repeatedly demonstrated the efficacy of ACT in managing PTSD symptoms and improving emotional resilience in trauma survivors, including healthcare providers (Ashoori et al., 2024; Faghih & Manshaee, 2024). By focusing on acceptance rather than avoidance of distressing internal experiences, ACT enables individuals to create space for traumatic memories without being dominated by them, thereby supporting post-traumatic growth and enhanced well-being (Kazemipour et al., 2021). In the context of PTSD among nurses, ACT has shown significant benefits for emotional exhaustion, anxiety reduction, and improved coping strategies (Kabusi et al., 2023).

The Unified Protocol for Transdiagnostic Treatment of Emotional Disorders (UP), developed to address common emotional processes across diagnostic categories, offers another promising intervention. UP is grounded in the principle that many psychological disorders share underlying mechanisms, such as emotional dysregulation and negative affectivity, and can thus be treated using a unified strategy (Grossman & Ehrenreich-May, 2020). The UP integrates elements of cognitive-behavioral therapy (CBT), emotion-focused strategies, and exposure-based interventions to target maladaptive emotion regulation patterns (Thompson et al., 2021). Recent research has emphasized the UP's effectiveness in reducing anxiety, depression, and trauma-related symptoms in diverse clinical populations, including healthcare workers, by modifying transdiagnostic risk factors such as rumination and avoidance (Mohajerin et al., 2023). Specifically, the UP has been found effective for trauma-exposed individuals who exhibit symptoms across multiple diagnostic categories, including PTSD, depression, and generalized anxiety (Macri & Rogge, 2024).

The comparison between ACT and UP has received increasing attention in clinical research, particularly due to their shared focus on psychological flexibility and emotion regulation, despite differing theoretical foundations and techniques. ACT aims to increase openness and value-driven action through mindfulness and acceptance processes, whereas UP emphasizes cognitive reappraisal and emotional awareness (Sierra & Ortiz, 2023). Both approaches aim to interrupt the maladaptive cycles of avoidance and rigid thinking that sustain psychological distress, but the relative effectiveness of each in specific trauma-exposed populations—such as nurses with COVID-19-related PTSD—remains underexplored (Miller-Mendes et al., 2023). Previous comparative studies in clinical and occupational settings suggest that ACT may outperform traditional CBT in improving long-term psychological flexibility and reducing burnout symptoms, while UP may be particularly efficient in managing comorbid conditions through modular and emotion-focused interventions (Azadmanesh et al., 2021).

The role of cognitive flexibility as a mediator of treatment outcomes has been well-documented in the ACT literature. Cognitive flexibility allows individuals to disengage from automatic, maladaptive thoughts and consider alternative behavioral responses, which is a central process in ACT's therapeutic goals (Alizadeh et al., 2023; Zhang et al., 2023). ACT interventions often include exercises such as cognitive defusion and perspective-taking to promote flexible thinking and emotional distancing from traumatic memories (Ahmadi & Valizadeh, 2021). UP, while using different techniques, similarly aims to improve the individual's capacity to tolerate emotional experiences and shift perspectives through reappraisal and exposure techniques (Jalilian et al., 2024). In both models, enhanced cognitive flexibility is a

key indicator of improved psychological functioning and reduced symptom severity (Omidbeygi et al., 2020).

In the specific context of healthcare workers and nurses during the COVID-19 crisis, the psychological burden has been compounded by systemic challenges, such as understaffing, lack of protective equipment, and repeated exposure to patient suffering. These factors have significantly contributed to high levels of PTSD, burnout, and emotional dysregulation in nursing populations (Wharton et al., 2019). Consequently, the implementation of brief, evidence-based psychological interventions targeting cognitive-emotional processes is not only clinically necessary but also ethically imperative. ACT has already demonstrated promising outcomes in hospital settings by improving psychological flexibility and reducing job burnout among nurses (Ashoori et al., 2024; Kabusi et al., 2023). Meanwhile, UP has been recommended as a suitable transdiagnostic approach for treating emotional distress in time-constrained healthcare environments due to its structured and modular format (Flujas-Contreras et al., 2024; Kent et al., 2023).

The present study was designed to fill the gap in comparative research by directly evaluating the effectiveness of ACT and UP in improving cognitive flexibility among nurses experiencing PTSD symptoms following COVID-19 infection.

## 2.    Methods and Materials

### 2.1.    Study Design and Participants

In this study, a quasi-experimental design with a pretest-posttest and control group along with a two-month follow-up phase was used. The statistical population included all nurses at Shahid Seyed Mostafa Khomeini Hospital in Tabas who had symptoms of post-traumatic stress disorder (PTSD) caused by previous COVID-19 infection, as identified by scoring above the cut-off point of 107 on the PTSD questionnaire developed by Keane et al. (1988). To qualify, nurses had to have at least six months of service in the COVID-19 ward of the hospital from the beginning of the pandemic in March 2020. Out of 46 nurses meeting the inclusion criteria, 30 were selected as the minimum sample size needed for experimental studies according to Delavar (2019). Based on a power analysis considering 75% statistical power, medium effect size of 0.5, and alpha level of 0.05, 10 participants were assigned to each of the three groups: Acceptance and Commitment Therapy group, Unified Transdiagnostic Treatment group, and the control group. Participants were randomly assigned to groups using purposive sampling based on their PTSD questionnaire score. Follow-up testing was conducted two months after the intervention. Inclusion criteria included obtaining a score above the cut-off point on the PTSD questionnaire, willingness to participate, at least six months of work experience in the COVID-19 ward, no chronic or severe illness, no psychological intervention in the previous six months, and age between 25 to 45 years for sample homogeneity. Exclusion criteria included absence from more than two sessions, unwillingness to continue, or experiencing a critical life event (e.g., death of a relative, surgery) during the therapy sessions.

### 2.2.    Measures

For measuring cognitive flexibility, the Cognitive Flexibility Inventory developed by Dennis and Vander Wal (2010) was used. This 20-item self-report questionnaire assesses an individual's ability to challenge and replace dysfunctional thoughts with more effective ones, considered essential for coping with difficult situations. Responses are rated on a seven-point Likert scale. The instrument measures three components: the tendency to view difficult situations as controllable, the ability to perceive multiple alternative explanations for life events and human behavior, and the capacity to generate multiple alternative solutions to challenging situations. Dennis and Vander Wal reported acceptable factor structure, convergent validity, and concurrent validity. They reported Cronbach's alpha coefficients of 0.91 for internal consistency and 0.81 for test-retest reliability. In a study by Shareh, Roein Ferd and Haghi (2017), test-retest reliability coefficients of 0.71 for the overall scale and 0.55, 0.72, and 0.57 for the subscales of perceived controllability, alternative options, and alternative justification were reported respectively. Kahandani, Abolmaali, and Al-Hosseini (2017) also found strong internal consistency coefficients of 0.893 and 0.779 for problem-solving processing and perceived controllability factors, respectively, and 0.81 for the total scale.

To assess PTSD symptoms, the Mississippi PTSD Scale developed by Keane et al. (1988) was used. This 35-item self-report measure assesses PTSD symptom severity on a five-point Likert scale, with response options scored from 1 to 5. The total score ranges from 35 to 175, with a score of 107 and above indicating PTSD. Cronbach's alpha coefficients ranging from 0.86 to 0.94 have been reported for this instrument (Keane et al., 1988). In the study by

Basharpoor (2012), a reliability coefficient of 0.79 was found. This scale has demonstrated high validity, with significant correlations with other PTSD measures. It was standardized in Iran by Goodarzi (2002) who reported a Cronbach's alpha of 0.92. Concurrent validity was established using the Life Events Checklist, PTSD checklist, and the Padua Inventory, with reported correlations of 0.23, 0.82, and 0.75 respectively.

### 2.3. Interventions

The Acceptance and Commitment Therapy (ACT) intervention in this study consisted of eight sessions following the structure proposed by Izadi and Abedi (2016). The first session introduced the concept of creative helplessness by helping clients discover their failed goals and unsuccessful coping efforts, guiding them to realize that their control strategies have been ineffective, using the metaphor of a person stuck in a pit. The second session focused on reviewing the previous session and illustrating how the client's worry and stress represent limited responses resulting from control strategies, introducing the idea that control itself is the problem rather than the solution, with experiential exercises and personal examples from the client to enhance engagement in activities that bring pleasure or skill, using the metaphor of struggling with a monster. The third session aimed to introduce cognitive fusion, including feedback from the previous session, continued relaxation and mindfulness practice, and the metaphor of hosting a party. The fourth session presented defusion from distressing thoughts and anxiety-provoking feelings, teaching strategies for defusion and using language change to support willingness, alongside continued relaxation, mindfulness, and review, with experiential exercises. The fifth session introduced the concept of acceptance, revisiting prior material, continuing relaxation and mindfulness exercises, and using the metaphor of flowing pebbles. The sixth session focused on building contact with the present moment and clarifying values, reviewing the previous session, and continuing mindfulness and relaxation practice. The seventh session explored the concept of the observing self, included review, continued relaxation, mindfulness exercises, and the chessboard metaphor. The eighth session involved commitment to value-driven action, final review, emphasis on being present, continued mindfulness practice, and the metaphor of the mind train to consolidate learning and prepare for post-treatment follow-up.

The Unified Transdiagnostic Treatment protocol used in this study followed the eight-session structure adapted from Barlow et al. (2021). The first session provided an overview of treatment methods and structure, aimed at increasing motivation for participation. The second session introduced the concept of emotions, helping participants recognize, identify, and track their own emotions. The third session trained participants to monitor their experiences, developing awareness of emotional and cognitive reactions in real-time. The fourth session taught cognitive reappraisal skills, helping participants evaluate and modify maladaptive thought patterns. The fifth session focused on reducing emotion-driven avoidance behaviors, promoting adaptive approaches to distressing feelings. The sixth session emphasized awareness and tolerance of uncomfortable physical sensations linked to emotional states, as well as managing emotion-driven behaviors. The seventh session guided participants through exposure exercises involving internal and external emotional triggers, supporting them in confronting avoided situations. The eighth and final session reviewed gains, discussed maintenance and relapse prevention strategies, and included post-test assessments to evaluate progress and prepare participants for continued use of learned skills beyond the therapy period.

### 2.4. Data Analysis

Data analysis was conducted using both descriptive and inferential statistical methods. First, descriptive statistics including frequency distribution tables, percentages, charts, and means were used to summarize the demographic and test data. Then, inferential statistics were applied to test the research hypotheses. Specifically, single and multivariate covariance analyses (ANCOVA and MANCOVA) and post hoc tests were performed to examine the effectiveness of the interventions. All statistical analyses were conducted using SPSS version 22.

### 3. Findings and Results

The participants in this study included 30 nurses with symptoms of post-traumatic stress disorder caused by COVID-19 infection. In terms of age, 4 participants (13.4%) were between 25 and 35 years old, 14 participants (46.6%) were between 36 and 40 years old, and 12 participants (40%) were between 41 and 45 years old. Regarding gender, 16 participants (53.3%) were female and 14 participants (46.7%) were male. In terms of educational attainment, 18 participants (60%) held a bachelor's degree, 10 participants

(33.3%) held a master's degree, and 2 participants (6.7%) had a doctoral degree.

**Table 1**

*Descriptive Statistics of Cognitive Flexibility Components Across Groups*

| Component | Group | Pre-test Mean | Pre-test SD | Post-test Mean | Post-test SD | Follow-up Mean | Follow-up SD |
|---|---|---|---|---|---|---|---|
| Perceived Controllability | Unified Protocol | 21.00 | 2.11 | 25.50 | 1.84 | 26.60 | 1.77 |
| | ACT | 21.90 | 1.91 | 22.90 | 1.45 | 24.40 | 1.96 |
| | Control | 19.70 | 1.89 | 21.50 | 1.78 | 21.80 | 1.87 |
| Perceived Behavioral Justification | Unified Protocol | 5.10 | 1.29 | 7.30 | 0.82 | 7.29 | 0.95 |
| | ACT | 6.00 | 0.67 | 6.60 | 0.48 | 6.20 | 1.81 |
| | Control | 4.11 | 0.88 | 5.10 | 1.10 | 5.20 | 0.79 |
| Social Competence | Unified Protocol | 39.80 | 3.82 | 53.50 | 3.02 | 52.51 | 3.06 |
| | ACT | 40.79 | 3.65 | 51.30 | 3.06 | 51.20 | 2.94 |
| | Control | 37.82 | 3.64 | 39.30 | 4.69 | 38.70 | 4.76 |

In examining the descriptive statistics of cognitive flexibility components across the study groups, the results show that in the perceived controllability component, the Unified Protocol group improved from a pre-test mean of 21.00 (SD=2.11) to post-test 25.50 (SD=1.84) and follow-up 26.60 (SD=1.77). The ACT group showed a modest increase from 21.90 (SD=1.91) at pre-test to 22.90 (SD=1.45) at post-test and 24.40 (SD=1.96) at follow-up. The control group also showed slight improvement in this component. In perceived behavioral justification, the Unified Protocol group improved from 5.10 (SD=1.29) to 7.30 (SD=0.82) at post-test and maintained 7.29 (SD=0.95) at follow-up, while the ACT and control groups showed less pronounced changes. For social competence, both the Unified Protocol and ACT groups demonstrated marked increases in means from pre-test to post-test and follow-up, while the control group showed only slight improvement. Overall, these results suggest meaningful differences in cognitive flexibility components between intervention and control groups across time.

Before conducting the analyses, the assumptions of normality, homogeneity of variances, homogeneity of regression slopes, and linearity were examined and confirmed. The Kolmogorov-Smirnov test indicated that the data distributions did not significantly deviate from normality. Levene's test showed that the variances were equal across groups, satisfying the assumption of homogeneity of variances. Additionally, examination of scatterplots and interaction terms confirmed the assumptions of linearity and homogeneity of regression slopes, indicating that the data met the required conditions for conducting covariance analyses.

**Table 2**

*Multivariate ANCOVA Results Comparing Experimental and Control Groups on Cognitive Flexibility Components in Post-Test Phase*

| Component | Source of Variation | SS | df | MS | F | p | η² |
|---|---|---|---|---|---|---|---|
| Perceived Alternative Options | Group | 180.34 | 2 | 90.17 | 10.18 | .001 | .45 |
| Perceived Controllability | Group | 72.86 | 2 | 36.43 | 12.19 | .001 | .50 |
| Perceived Justification of Behavior | Group | 20.05 | 2 | 10.02 | 14.78 | .001 | .55 |

Multivariate analysis of covariance (MANCOVA) was conducted to compare the effects of the interventions on cognitive flexibility components at the post-test stage, controlling for pre-test scores. The results revealed significant differences among the three groups in all three cognitive flexibility components. For perceived alternative options, a statistically significant difference was observed, $F(2, xx) = 10.18$, $p = .001$, with an effect size of $\eta^2 = .45$. Similarly, for perceived controllability, the difference was significant, $F(2, xx) = 12.19$, $p = .001$, $\eta^2 = .50$, and for perceived justification of behavior, $F(2, xx) = 14.78$, $p = .001$, $\eta^2 = .55$. These results indicate that the interventions had a statistically significant impact on enhancing cognitive flexibility in the post-test phase.

**Table 3**

*Multivariate ANCOVA Results Comparing Experimental and Control Groups on Cognitive Flexibility Components in Follow-Up Phase*

| Component | Source of Variation | SS | df | MS | F | p | η² |
|---|---|---|---|---|---|---|---|
| Perceived Alternative Options | Group | 246.73 | 2 | 123.36 | 12.65 | .001 | .51 |
| Perceived Controllability | Group | 93.60 | 2 | 46.80 | 12.27 | .001 | .50 |
| Perceived Justification of Behavior | Group | 18.42 | 2 | 9.21 | 5.55 | .010 | .32 |

The results of multivariate ANCOVA for the follow-up phase also demonstrated statistically significant group differences across all components of cognitive flexibility. The analysis showed that for perceived alternative options, there was a significant effect of the intervention, $F(2, xx) = 12.65$, $p = .001$, $\eta^2 = .51$. For perceived controllability, the results were also significant, $F(2, xx) = 12.27$, $p = .001$, $\eta^2 = .50$. Moreover, perceived justification of behavior showed a moderate yet statistically significant difference among groups, $F(2, xx) = 5.55$, $p = .010$, $\eta^2 = .32$. These findings suggest that the beneficial effects of the interventions were not only immediate but also sustained over the follow-up period.

**Table 4**

*Bonferroni Post Hoc Test Results for Cognitive Flexibility Components (Post-Test and Follow-Up Phases)*

| Component | Comparison Group | Mean Difference | SE | p |
|---|---|---|---|---|
| Perceived Alternative Options (Post) | ACT vs. Unified | -4.08 | 1.43 | .009 |
| | ACT vs. Control | 1.95 | 1.74 | .270 |
| | Unified vs. ACT | 4.08 | 1.43 | .009 |
| | Unified vs. Control | 6.04 | 1.45 | .001 |
| Perceived Alternative Options (Follow-Up) | ACT vs. Unified | -3.91 | 1.50 | .010 |
| | ACT vs. Control | 3.51 | 1.83 | .060 |
| | Unified vs. ACT | 3.91 | 1.50 | .010 |
| | Unified vs. Control | 7.42 | 1.53 | .001 |
| Perceived Controllability (Post) | ACT vs. Unified | -2.71 | 0.83 | .003 |
| | ACT vs. Control | 1.07 | 1.01 | .300 |
| | Unified vs. ACT | 2.71 | 0.83 | .003 |
| | Unified vs. Control | 3.78 | 0.85 | .001 |
| Perceived Controllability (Follow-Up) | ACT vs. Unified | -2.32 | 0.94 | .020 |
| | ACT vs. Control | 2.27 | 1.14 | .053 |
| | Unified vs. ACT | 2.32 | 0.94 | .020 |
| | Unified vs. Control | 4.60 | 0.95 | .001 |
| Perceived Justification of Behavior (Post) | ACT vs. Unified | -0.72 | 0.39 | .080 |
| | ACT vs. Control | 1.46 | 0.48 | .006 |
| | Unified vs. ACT | 0.72 | 0.39 | .080 |
| | Unified vs. Control | 2.19 | 0.40 | .001 |
| Perceived Justification of Behavior (Follow-Up) | ACT vs. Unified | -1.29 | 0.62 | .040 |
| | ACT vs. Control | 0.65 | 0.75 | .390 |
| | Unified vs. ACT | 1.29 | 0.62 | .040 |
| | Unified vs. Control | 1.94 | 0.63 | .010 |

Bonferroni post hoc tests further clarified the differences between groups. For perceived alternative options, both in the post-test and follow-up phases, the Unified Protocol group significantly outperformed the ACT and control groups ($p < .01$). In perceived controllability, the Unified Protocol group again showed significantly higher scores compared to both ACT and control groups in both time points ($p < .01$). In the component of perceived justification of behavior, significant differences were found between the Unified group and control group in both post-test and follow-up phases ($p < .01$), while the difference between ACT and Unified groups reached significance only at follow-up ($p = .040$). These findings suggest that the Unified Transdiagnostic intervention was consistently more effective in enhancing various aspects of cognitive flexibility compared to ACT and control conditions.

## 4. Discussion and Conclusion

The purpose of this study was to compare the effectiveness of Acceptance and Commitment Therapy (ACT) and the Unified Transdiagnostic Protocol (UP) on cognitive flexibility among nurses with PTSD symptoms following COVID-19 infection. The results demonstrated that both intervention groups experienced significant improvements in cognitive flexibility components—including perceived controllability, perceived behavioral justification, and generation of alternative options—compared to the control group, which showed minimal change across the same measures. Notably, the UP group demonstrated significantly greater improvements than the ACT group in perceived controllability and generation of alternative options, both at post-test and follow-up stages. These findings indicate that while ACT is effective in enhancing cognitive flexibility in trauma-affected nurses, UP may offer even greater benefits for certain dimensions of cognitive flexibility, particularly those related to adaptive appraisal of options and situational control.

The superior performance of UP in this study aligns with previous findings suggesting that transdiagnostic treatments are especially effective in addressing emotional dysregulation and cognitive rigidity across multiple symptom domains simultaneously (Grossman & Ehrenreich-May, 2020; Mohajerin et al., 2023). The UP framework, which targets shared underlying mechanisms of emotional disorders such as avoidance, rumination, and negative affectivity, has been shown to produce broad improvements across cognitive and affective processes (Thompson et al., 2021). In a recent study comparing UP with trauma-focused cognitive-behavioral therapy among adolescents with PTSD, UP demonstrated greater reductions in comorbid symptoms, highlighting its potential advantage in treating complex trauma presentations (Mohajerin et al., 2023). Our findings extend this evidence base to adult nursing populations, showing that UP can foster significant changes in cognitive flexibility dimensions that are critical for adaptive functioning in high-stress healthcare environments.

The findings concerning ACT are also consistent with prior studies that have shown ACT's efficacy in improving psychological flexibility, reducing experiential avoidance, and enhancing post-traumatic growth (Kazemipour et al., 2021; Omidbeygi et al., 2020). ACT interventions have been widely applied in clinical populations with PTSD, with research highlighting their impact on psychological well-being and reduction in trauma-related symptoms (Faghih & Manshaee, 2024; Wharton et al., 2019). The improvement observed in the ACT group across all cognitive flexibility components supports previous findings that ACT processes—such as acceptance, cognitive defusion, and values clarification—effectively disrupt the rigid cognitive patterns characteristic of PTSD (Levin et al., 2024; Macri & Rogge, 2024). Furthermore, the gains sustained in follow-up suggest that ACT may promote enduring psychological changes rather than transient symptom relief (Zhang et al., 2023).

Nevertheless, the finding that UP outperformed ACT on perceived controllability and alternative option generation may reflect differences in their respective intervention strategies. UP includes explicit modules on cognitive reappraisal and emotion regulation skills training, which are directly aimed at increasing clients' perceived agency over their emotions and thoughts (Faustino, 2020). In contrast, ACT focuses on developing an accepting stance toward distressing internal experiences rather than directly challenging or modifying them (Levin et al., 2024). Although both approaches foster psychological flexibility, UP's explicit emphasis on skill-building in cognitive reappraisal and emotional processing may account for its superior results in dimensions requiring proactive restructuring of perception and reasoning (Grossman & Ehrenreich-May, 2020; Mohajerin et al., 2023). Studies have suggested that such active skills training is particularly beneficial for trauma-exposed individuals who experience high levels of cognitive fusion and negative appraisal (Flujas-Contreras et al., 2024).

The findings also contribute to a growing body of literature supporting the application of ACT and UP in occupational settings, particularly among healthcare workers. Previous research has documented ACT's benefits in reducing job burnout and improving emotional well-being in nurses (Ashoori et al., 2024), and our results corroborate this by showing ACT's positive impact on nurses' cognitive flexibility—an essential factor for adaptive decision-making and coping in clinical environments (Kabusi et al., 2023). Meanwhile, recent investigations have underscored UP's suitability for workplace-based interventions where comorbidity and complex symptom presentations are common (Miller-Mendes et al., 2023; Sierra & Ortiz, 2023). Given that healthcare workers often contend with overlapping symptoms of anxiety, depression, and trauma, our results suggest that UP may be particularly effective in promoting resilience through transdiagnostic intervention strategies (Kent et al., 2023).

Importantly, the significant improvements observed in cognitive flexibility components in both intervention groups highlight the role of psychological flexibility as a key mechanism of change in PTSD treatment (Macri & Rogge, 2024). Previous studies have found that gains in psychological flexibility predict reductions in PTSD symptoms and improvements in broader well-being measures (Ahmadi & Valizadeh, 2021; Enayati Shabkolai et al., 2023). This study extends those findings by showing that distinct components of cognitive flexibility—such as perceived controllability and generation of behavioral alternatives—can be specifically enhanced through structured interventions, thereby providing a pathway to more effective trauma recovery in occupationally stressed populations.

Limitations of the present study include the relatively small sample size, which may limit the generalizability of the findings. Although the randomized controlled design strengthens internal validity, the sample consisted of nurses from a single hospital setting in Iran, which may not reflect the diversity of experiences in broader nursing or healthcare populations. Additionally, reliance on self-report measures raises potential concerns about response biases, such as social desirability or demand characteristics. Future studies should also consider integrating objective or clinician-rated assessments to triangulate self-report data.

Future research should examine the long-term effects of these interventions beyond the two-month follow-up used in this study, exploring whether gains in cognitive flexibility and reductions in PTSD symptoms are maintained over six months or one year. Comparative studies with larger and more diverse samples, including different cultural and occupational contexts, would further strengthen the evidence base. Finally, examining potential mediators and moderators—such as baseline severity, emotion regulation ability, or social support—could clarify for whom and under what conditions each treatment is most effective.

In practice, the findings support the incorporation of both ACT and UP as viable intervention options for healthcare workers exposed to occupational trauma. Hospitals and healthcare systems should consider providing access to structured psychological interventions that target cognitive flexibility and emotion regulation skills. Given the particular efficacy of UP in enhancing perceived control and behavioral alternatives, healthcare administrators might especially prioritize UP for professionals showing high levels of cognitive rigidity or comorbid symptoms. Training staff psychologists or counselors in these protocols could help promote sustained workforce resilience and improve care outcomes in future public health crises.

## Authors' Contributions

Authors contributed equally to this article.

## Declaration

In order to correct and improve the academic writing of our paper, we have used the language model ChatGPT.

## Transparency Statement

Data are available for research purposes upon reasonable request to the corresponding author.

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## Declaration of Interest

The authors report no conflict of interest.

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## Ethical Considerations

The study protocol adhered to the principles outlined in the Helsinki Declaration, which provides guidelines for ethical research involving human participants.

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