



# Effectiveness of Acceptance and Commitment Therapy on Stress, Cognitive-Attentional Syndrome, and Blood Sugar Indices in Patients with Type II Diabetes

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## Abstract

**Background:** Psychological problems are mainly overlooked in patients with chronic diseases.

**Objectives:** The present study aimed to investigate the effectiveness of acceptance and commitment therapy on stress, cognitive-attentional syndrome, and blood sugar indices in patients with type II diabetes.

**Methods:** In this quasi-experimental study, 40 patients with type II diabetes, referred to Birjand Diabetes Clinic in 2019 were selected via convenience sampling method. Later, subjects meeting inclusion criteria were randomly assigned into experimental and control groups. The former received treatment based on acceptance and commitment therapy (ACT) in eight 90-minute weekly sessions. Controls received no intervention. Fasting Blood Sugar (FBS) and glycosylated hemoglobin indices were measured for all participants before and after the intervention. The data were collected, followed by administering DASS scale developed by Lovibond and Lovibond (1995) and Wells cognitive attentional syndrome or CAS (2009) questionnaires and analyzed using SPSS 22. Univariate and multivariate analyses of covariance were also performed at a significance level of 0.05.

**Results:** The participants' mean educational level and age were ( $1.53 \pm 2.70$ ) and ( $6.03 \pm 45.58$ ), respectively. Also, the mean values of the variables CAS, stress, HBA<sub>1c</sub>, and FBS were ( $22.51 \pm 94.09$ ), ( $09.09 \pm 36.30$ ), ( $0.90 \pm 7.34$ ) and ( $29.09 \pm 151.82$ ), respectively. Also, the mean scores of stress ( $P = 0.002$ ), CAS ( $P = 0.001$ ), FBS ( $P = 0.001$ ), and glycosylated hemoglobin ( $P = 0.001$ ) indices were significantly lower in experimental compared to controls after the intervention.

**Conclusions:** In general, ACT effectively reduced stress, cognitive attention syndrome, and blood sugar indices among patients with type II diabetes. Experts should consider formality of this training in diabetes care treatment programs.

**Keywords:** Stress, Cognitive Attentional Syndrome, Fasting Blood Sugar, Glycosylated Hemoglobin, Acceptance and Commitment Therapy, Type II Diabetes

## 1. Background

Diabetes can affect people's physical, mental, social, communication performance and causes despair (depression) that leads to threatening conditions and their disability and imposes a lot of stress and anxiety on them. People with diabetes are anxious about social interactions due to constant life changes, fear of high blood sugar, and understanding how they differ from others (1). Accordingly, studies show the occurrence of such long-term complications as cardiac, ocular, renal, psychological, personal, family, and social relationships in these patients (2), as well as psychological disorders, hurting patient's ability to perform and continue medical care (3). Additionally, stress is

a psychological problem that diabetics face. It has feelings of sadness, mental pressure, and anxiety that cause fatigue, concentration lack, irritability, and damage to health (4). High perception of stress has many adverse physical, psychological, and social effects, and the more severe the perceived stress, the greater risk (5).

Besides, content and style of thinking are important factors in the emergence and persistence of mental disorders among damage-experienced persons. From metacognitive perspective, a mental disease is caused by activating a specific and poisonous thinking style, called cognitive attentional syndrome (CAS), which is defined as a repetitive thinking style manifesting itself in thinking with worries,

considerable attention to threat, and dysfunctional coping mechanisms (6). This syndrome preserves threat-based processing or being locked in traumatic events. Worrying and pensiveness activate and perpetuate threat-feeling, turning anxiety and depression into permanent states (7). Many studies confirm the role of components of CAS in psychological disorders development (8). According to the literature, diabetics' stress and depression are associated with poor control of blood sugar and higher glycosylated hemoglobin (HBA<sub>1c</sub>), decreased physical functioning, more physical complications of diabetes, and increased health care costs (9). An appropriate, relevant treatment is acceptance and commitment therapy (ACT), that is known as the third wave of cognitive-behavioral therapies, where it is tried to increase psychological connection with thoughts and feelings (10). The ACT uses direct dependencies and indirect verbal processes in therapeutic communication to create a meta-empirical sense of self through acceptance of experience, diffusion, or disintegration of thoughts, providing more psychological flexibility in the person (11). Also, the desired outcome of ACT is not to reduce symptoms but is to increase psychological flexibility (12).

The ACT could effectively reduce the severity of depressive symptoms among male military personnel with type II diabetes (13). ACT effectively reduces depression scores of patients with type II diabetes (14). A significant difference was between experimental and control groups in overall scores of depression and anxiety, stress, and coping styles among such patients (15). Also, there was no significant difference between the groups in terms of LDL, HDL, TG, TC, and blood sugar levels before the intervention (16). Due to diabetes' chronic, non-contagious and costly nature and creating an enormous financial burden, paying serious attention to diabetes and its consequences is necessary. Treating type II diabetes is actually a challenge (17). Besides, as a basic treatment for chronic diseases' control, training plays an increasing role in restoring patients' health and recovery in present era (18). Empirical evidence for ACT's effectiveness on multiple disorders increases (19).

## 2. Objectives

Theoretically, the present study aimed to recognize the role of stress and CAS in diabetic patients. Finally, our findings obtained help determine and evaluate ways to prevent, control, and treat patients with type II diabetes, assisting in planning and evaluating overall programs to improve the living standards of families both at local (provincial) and domestic levels.

## 3. Methods

### 3.1. Study Design

The present study is a quasi-experimental intervention with pre-test and post-test design.

### 3.2. Sample

The statistical population included all patients with type II diabetes referred to Birjand Diabetes Clinic in 2019 with a number of 105. Through minimization method and simple random assignment, 40 patients were divided into experimental and control groups as volunteers considering inclusion (reading-writing ability, age of 30 - 60, definitive diagnosis of type II diabetes) and exclusion criteria (absence of more than two sessions, occurrence of great stress and unwillingness to continue cooperation). The sampling process was performed for forty days, and intervention process was performed for eight weeks.

### 3.3. Data Collection

As these instruments are general scales available for every researcher, and while we had no access to the developer, we found no need to get permission from authors. The data collection tools were as follows:

Depression, anxiety, and stress scale (DASS-42), developed by Lovibond and Lovibond in 1995, contains 42 items about three components of stress, anxiety, and depression. Here, 14 statements related to the stress were applied. Scoring is based on a 4-point Likert scale. The questionnaire validation was undertaken in (2), where Cronbach's alpha was calculated to be 0.77, 0.76, and 0.66 for depression, stress, and anxiety, respectively. Its reliability was corroborated via Cronbach's alpha of 0.92 for stress.

Sixteen-item CAS questionnaire was designed by Wells in 2009, where the first two questions measure respondents' frequency of anxiety and attention to the threatening stimuli. The following six questions assess frequency of strategies employed by respondents in dealing with negative emotions and thoughts. The following eight questions measure individual's faith in each metacognitive belief about CAS symptoms. This questionnaire is scored based on an 8-point Likert scale. The reliability of the CAS was confirmed in the studies of Fergus et al. (8) and, Salmani and Hasani (21) using Cronbach's alpha of 0.78 and 0.85, respectively. Here, the reliability was found to be 0.71 by Cronbach's alpha.

FBS test: Blood samples were collected from patients followed by about 8 to 12 hours of fasting to measure their FBS and glycosylated hemoglobin indices, measured by MINDRAY BS38 auto-analyzer. It is noteworthy to mention that FBS is a conventional test, which can be conducted at any medical laboratory approved by Iranian Ministry of Health.

### 3.4. Intervention

Blood glucose indices were measured, and stress and cognitive syndrome questionnaires were completed by participants. The researcher with psychological expertise held the sessions, followed by obtaining written consent from participants. For experimental group members, ACT sessions were held in eight weekly 90-min sessions, which were conducted by a clinical psychologist and a senior counselor with a history of ACT. Controls received no psychological intervention. Ultimately, all participants completed research tools again. A summary of treatment plan and its content is provided in [Table 1](#).

At the intervention end, patients' blood glucose indices were measured again in both groups, and they completed the stress and cognitive syndrome questionnaires.

### 3.5. Data Analysis

Data were analyzed using SPSS Ver.22 software. For statistical tests, the mean and standard deviation (SD) were used in the descriptive part, and univariate and multivariate analysis of covariance were used in the inferential part with a significance level of  $\alpha = 0.05$ .

## 4. Results

Most of the patients (85% in the experimental group and 65% in the control group) were aged 41 - 50 years. A major of the patients in the experimental group had not finished high school, while most of the controls (45%) had bachelor's and master's degrees ([Table 2](#)).

In order to eliminate the score's distorting effect before the intervention, the analysis of covariance was used to compare the variables' mean values between the two groups. The level of significance for all variables was calculated to be more than 0.05 by Kolmogorov-Smirnov test, so normal distribution was confirmed. Based on the Box test result, which was not significant for any of the variables, the condition of homogeneity of variance/covariance matrices was correctly satisfied ( $P = 0.08$ ). Additionally, based on Levene's test and its non-significance for all variables, the condition of equality of variance was satisfied ( $P > 0.05$ ) ([Table 3](#)).

The results of the analysis of covariance showed that the mean score of stress, CAS, and blood sugar indices (FBS and glycosylated hemoglobin) after the intervention in the experimental group was significantly lower than that of the controls ( $P < 0.01$ ). In other words, it can be concluded that ACT has been effective in reducing stress, CAS, and blood sugar indices among patients with type II diabetes ( $P < 0.01$ ). The ETA coefficient for the variables of pressure, CAS, FBS, and glycosylated hemoglobin was 0.23, 0.31, 0.38,

and 0.54, respectively, which indicates the effect of ACT on reducing these variables among the studied variables patients ([Table 3](#)).

## 5. Discussion

The present study evaluated the effectiveness of ACT on Stress, CAS, and blood sugar indices in patients with type II diabetes. Our results established the effectiveness of ACT on reducing stress, CAS, and blood sugar indices among patients with type II diabetes. Alongside our findings, some studies also report the significant effect of ACT on stress reduction among patients with type II diabetes ([22-24](#)). Accordingly, ACT improves the perception of life challenges by providing clients with acceptance techniques, inviting people to experience unpleasant feelings without trying to control them and helping them face the personal, family, and social life challenges. Thus, clients' feelings of avoidance, anxiety, fear of challenges, and stress are reduced ([25](#)). At high levels of acceptance, people can notice psychological stimuli of their thoughts and feelings without attempting to control or avoid them ([13](#)).

Consequently, the impact of these thoughts and feelings is reduced on their performance. At low levels of acceptance, people engage in control strategies to revise their thoughts and feelings, leading to degradation of their performance and behavior. Therefore, people with type II diabetes who apply these methods evaluate their thoughts and feelings appropriately in stressful events due to their non-judgmental acceptance and commitment ([26](#)). Therefore, ACT reduced the perception of stress in diabetic people.

Regarding CAS reduction among patients with type II diabetes, a research reported that metacognitive therapy significantly reduced CAS ([27](#)), which was indirectly in line with our results. Since people with diabetes have difficulty thinking about the future and its problems, practicing diffusion techniques in ACT helps them deal with disturbing schemas. Clients learn to separate themselves from their thoughts and see the problem as a small part of themselves by self-observation techniques ([28](#)). Such patients cannot tolerate the process of threat-related perceptions. In other words, since they avoid all risk-related negative emotions, they will never be able to work on their problems and find a solution for them. The effect of ACT can be explained by its governing processes. Thus, the component of desire and acceptance allows to accept unpleasant inner experiences without trying to control them, and doing so makes those experiences seem less threatening and having less impact on the person's life ([29](#)).

Regarding FBS, it was shown that the mean blood sugar level after ACT intervention in patients in the experimental

**Table 1.** Summary of Topics Covered in ACT

Session	Topic	Content	Practice
1	Expressing treatment sessions goals and conducting pre-tests, awareness training (using body as a center)	Introducing instructor, making members familiar with each other and establishing a therapeutic relationship, introducing ACT approach and its main goals and axes, explaining rules governing treatment sessions, resting and catering, assigning homework.	Eating raisins
2	Facing obstacles, being aware of pleasant events	Reviewing previous session experiences, checking individual willingness to change, examining clients' expectations of ACT training, summarizing discussions, assigning homework.	Body inspection
3	Mindfulness, sitting meditation, mind wandering	Identifying ineffective control strategies, explaining acceptance concept and its difference with the concepts of failure, despair, denial, resistance, etc., defining effective and ineffective coping strategies, checking next session's exercise, assigning homework.	Seeing or hearing
4	Staying in the moment, experience discovery	Explaining behavioral homework and commitment, introducing and understanding the self-conceptualized integration, describing the application of ACT in the performance of problem-making chains of language and metaphors, summarizing the discussions in session, reviewing next session practice, assigning homework.	Meditation/yoga
5	Creating a different relationship with experience, deliberately bringing to mind difficulties and problems	Demonstrating separation between oneself, inner experiences, and behavior, viewing oneself as context, checking next session practice, assigning homework.	3-minute breathing
6	Dealing with thoughts in mindfulness approach, seeing bar in the mind	Identifying patients' life values and specifying and highlighting these values and paying attention to their choice, using mindfulness techniques with an emphasis, checking next session's practice, assigning homework.	Standing behind the waterfall
7	Stress prevention programs	Examining values of each individual and deepening previous concepts, explaining differences between values, goals, and common mistakes in choosing values	Seeing relationship between activity and mood
8	Mindfulness, future, closing and summarizing, running post-test	Identifying behavioral plans by values and creating obligations to work on them, making commitment for action, Explaining about the concept of recurrence and readiness to deal with it, reviewing assignments and summarizing sessions, sharing experiences, achievements, and expectations of group members with each other	Body inspection and reviewing the assignments

**Table 2.** The Participants' Demographic Characteristics <sup>a</sup>

Variables	Experimental	Control	P-Value
Age (y)			0.41 <sup>b</sup>
30 - 40	2 (10)	5 (25)	
41 - 50	17 (85)	13 (65)	
51 - 60	1 (5)	2 (10)	
Educational level			0.37 <sup>c</sup>
Before high school	8 (40)	4 (20)	
Diploma and advanced diploma	6 (30)	7 (35)	
Bachelor's and master's	6 (30)	9 (45)	

<sup>a</sup> Values are expressed as No. (%).

<sup>b</sup> Fisher's exact test

<sup>c</sup> Chi-squared

group was significantly lower than the controls (30). Also, ACT health lifestyle therapy increased self-care ability and decreased glycosylated hemoglobin in patients with type II diabetes (10). Furthermore, ACT can significantly reduce HBA<sub>1</sub>C (16). Increased adherence in diabetic patients leads

them to pay more attention to themselves and their health, and to perform better and more self-care behaviors, that is, taking prescribed medications and insulin on time, following the recommended diet, exercising more, and measuring their daily blood sugar (31).

### 5.1. Conclusions

The findings of the present study showed that ACT had a significant effect on stress, CAS, and FBS indices in patients with type II diabetes. Therefore, the therapists are proposed to take advantage of this approach to enhance clinical conditions of their clients. We faced some limitations, including a lack of follow-up period and absence of sufficient background in research variables, particularly CAS. Besides, the following suggestions are offered: (1) Designing a remarkable ACT plan for diabetic patients and formal integration of this training in their care programs. (2) Holding workshops with the present method to increase the structure of thinking and problem-solving and ultimately increase the patient's abilities, thereby improving the health.

**Table 3.** Results of Analysis of Covariance for Comparison of Post-test Scores Between Groups<sup>a</sup>

Source	Sum of Squares	df	Mean Square	F	Partial Eta Squared	P-Value
<b>CAS</b>						
Corrected model	4828.891	1	4828.891	1393.170	0.974	0.001
Group	58.290	1	-	-	-	-
Error	128.246	37	58.290	16.817	0.312	0.001
Total	5024.478	40	128.246	-	-	-
<b>Stress</b>						
Corrected model	1802.776	2	1802.776	53.934	0.593	0.001
Group	369.768	1	369.768	11.063	0.230	0.002
Error	1236.734	37	1236.734	-	-	-
Total	3224.400	40	-	-	-	-
<b>HBA<sub>1c</sub></b>						
Corrected model	193.202	2	193.202	42.231	0.540	0.001
Group	1.658	1	1.658	21.848	0.128	0.001
Error	2.732	37	2.732	-	-	-
Total	197.592	40	-	-	-	-
<b>FBS</b>						
Corrected model	5623.010	1	5623.010	42.234	0.540	0.001
Group	42.234	1	42.234	21.851	0.269	0.001
Error	4.292	37	4.292	-	-	-
Total	5669.536	39	-	-	-	-

<sup>a</sup> Computed based on alpha = 0.05

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## Footnotes

**Authors' Contribution:** Study concept and design: G. S., and E. K.; Analysis and interpretation of data: E. K., and M. R.; Drafting of the manuscript: E. K.; Critical revision of the manuscript for important intellectual content: G. S., M. S., and M. R.; Statistical analysis: E. K.

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**Ethical Approval:** Before examination, necessary permits were obtained from Ethics Committee of Birjand University of Medical Sciences (IR.BUMS.REC.1398.189, Link: [ethics.research.ac.ir/ProposalCertificateEn.php?id=89000](http://ethics.research.ac.ir/ProposalCertificateEn.php?id=89000)).

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**Informed Consent:** The participants provided us with the informed consent verbally.

## References

1. Aro A, Kauppinen A, Kivinen N, Selander T, Kinnunen K, Tuomilehto J, et al. Life Style Intervention Improves Retinopathy Status-The Finnish Diabetes Prevention Study. *Nutrients*. 2019;**11**(7):1691. doi: [10.3390/nu11071691](https://doi.org/10.3390/nu11071691). [PubMed: [31340493](https://pubmed.ncbi.nlm.nih.gov/31340493/)]. [PubMed Central: [PMC6683279](https://pubmed.ncbi.nlm.nih.gov/PMC6683279/)].
2. Ghazi A, Landerman LR, Lien LF, Colon-Emeric CS. Impact of Race on the Incidence of Hypoglycemia in Hospitalized Older Adults With Type 2 Diabetes. *Clinical Diabetes*. 2013;**31**(2):66-72. doi: [10.2337/dia-clin.31.2.66](https://doi.org/10.2337/dia-clin.31.2.66).
3. Arigo D, Smyth JM, Haggerty K, Raggio GA. The social context of the relationship between glycemic control and depressive symptoms in type 2 diabetes. *Chronic Illn*. 2015;**11**(1):33-43. doi: [10.1177/1742395314531990](https://doi.org/10.1177/1742395314531990). [PubMed: [24737703](https://pubmed.ncbi.nlm.nih.gov/24737703/)].
4. Wellen KE, Hotamisligil GS. Inflammation, stress, and diabetes. *J Clin Invest*. 2005;**115**(5):1111-9. doi: [10.1172/JCI25102](https://doi.org/10.1172/JCI25102). [PubMed: [15864338](https://pubmed.ncbi.nlm.nih.gov/15864338/)]. [PubMed Central: [PMC1087185](https://pubmed.ncbi.nlm.nih.gov/PMC1087185/)].
5. Warren CS, Holland S, Billings H, Parker A. The relationships between fat talk, body dissatisfaction, and drive for thinness: per-



- ceived stress as a moderator. *Body Image*. 2012;**9**(3):358-64. doi: [10.1016/j.bodyim.2012.03.008](https://doi.org/10.1016/j.bodyim.2012.03.008). [PubMed: [22521180](https://pubmed.ncbi.nlm.nih.gov/22521180/)].
6. Wells A, Welford M, King P, Papageorgiou C, Wisely J, Mendel E. A pilot randomized trial of metacognitive therapy vs applied relaxation in the treatment of adults with generalized anxiety disorder. *Behav Res Ther*. 2014;**48**(5):429-34. doi: [10.1016/j.brat.2009.11.013](https://doi.org/10.1016/j.brat.2009.11.013). [PubMed: [20060517](https://pubmed.ncbi.nlm.nih.gov/20060517/)].
  7. Sendi F, Ehteshamzadeh P, Asgari P, Kafie M. [The relationship Cognitive Attentional Syndrome (CAS), with anxiety and depression in burned patients: the mediating role of coping styles]. *J Health Psychol*. 2017;**6**(23):74-91. Persian.
  8. Fergus TA, Bardeen JR, Orcutt HK. Attentional control moderates the relationship between activation of the cognitive attentional syndrome and symptoms of psychopathology. *Pers Individ Differ*. 2012;**53**(3):213-7. doi: [10.1016/j.paid.2012.03.017](https://doi.org/10.1016/j.paid.2012.03.017).
  9. Waitzfelder B, Gerzoff RB, Karter AJ, Crystal S, Bair MJ, Ettner SL, et al. Correlates of depression among people with diabetes: The Translating Research Into Action for Diabetes (TRIAD) study. *Prim Care Diabetes*. 2010;**4**(4):215-22. doi: [10.1016/j.pcd.2010.07.002](https://doi.org/10.1016/j.pcd.2010.07.002). [PubMed: [20832375](https://pubmed.ncbi.nlm.nih.gov/20832375/)]. [PubMed Central: [PMC4269468](https://pubmed.ncbi.nlm.nih.gov/PMC4269468/)].
  10. Hor M, Aghaei A, Abedi A, Golparvar M. [Effect of combined treatment package (ACT-based healthy lifestyle) with mindfulness-based therapy on self-care and Glycated hemoglobin in patients with diabetes mellitus, Type 2]. *J Islamic Life Style*. 2018;**2**(2):65-70. Persian.
  11. Joshan-Poush S, Fazilat-Pour M, Rahmati A. [The effectiveness of parent-child relationship training based on ACT on the parent-adolescent conflict of mothers with epileptic child]. *Res Cogn Behav Sci*. 2018;**7**(2):39-50. Persian.
  12. Alavi Zadeh F, Shakerian A. [The Effectiveness of Acceptance and Commitment Therapy on Reducing Stress, Anxiety and Depression in Married Females Experiencing Infidelity (Emotional- Sexual)]. *Iran J Psychiatr Nurs*. 2017;**4**(6):8-14. Persian. doi: [10.21859/ijpn-04063](https://doi.org/10.21859/ijpn-04063).
  13. Bastami M, Goodarzi N, Dowran B, Taghva A. [Effectiveness of treatment acceptance and commitment therapy (ACT) on the reduction of depressive symptoms of military personnel with type 2 diabetes mellitus]. *Ebnesina*. 2016;**18**(1):11-8. Persian.
  14. Fathi Ahmadsaraei N, Neshat Doost HT, Manshaee GR, Nadi MA. [The Effectiveness of Acceptance and Commitment Therapy on Quality of Life among Patients with Type 2 Diabetes]. *Iran J Health Educ Health Promot*. 2016;**4**(1):31-9. Persian. doi: [10.18869/acadpub.ihepsaj.4.1.31](https://doi.org/10.18869/acadpub.ihepsaj.4.1.31).
  15. Behrouz B, Bavali F, Heidarzadeh N, Farhadi M. [The effectiveness of acceptance and commitment therapy on psychological symptoms, coping styles, and quality of life in patients with type-2 diabetes]. *J Health*. 2016;**7**(2):236-53. Persian.
  16. Rahimi N, Marandi SM, Esfarjani F, Ghasemi GA, Habibi N. [The effect of one cycle of yoga exercises on blood lipid of the female patients with type II diabetes]. *Sadra Med Sci J*. 2014;**2**(3):223-34. Persian.
  17. Xie W, Zhao Y, Zhang Y. Traditional chinese medicines in treatment of patients with type 2 diabetes mellitus. *Evid Based Complement Alternat Med*. 2011;**2011**:726723. doi: [10.1155/2011/726723](https://doi.org/10.1155/2011/726723). [PubMed: [21584252](https://pubmed.ncbi.nlm.nih.gov/21584252/)]. [PubMed Central: [PMC3092648](https://pubmed.ncbi.nlm.nih.gov/PMC3092648/)].
  18. Khorasani P, Eskandari M. [Comprehensive Epidemiology in Health Sciences]. Tehran, Iran: Kankash; 2004. Persian.
  19. Anvari MH. [The Effectiveness of group-based acceptance and commitment therapy on pain index, stress, anxiety, depression, catastrophizing & life satisfaction in patients with chronic pain] [thesis]. Isfahan University of Isfahan; 2013. Persian.
  20. Moghaddam Asghari MA, Saed F, Dibajnia P, Zangeneh J. [A preliminary validation of the depression, anxiety and stress scales (DASS) in non-clinical sample]. *Daneshvar Raftar*. 2008;**15**(31):23-38. Persian.
  21. Salmani B, Hasani J. [Cognitive attentional syndrome (cas) & cognitive emotion regulation strategies: Transdiagnostic processes or diagnostic based on mood & anxiety disorders]. *J Clin Psychol*. 2013;**5**(3):91-104. Persian.
  22. Aghayosefi A, Alipour A, Rahimi M, Abaspour P. [Investigation of the efficacy of acceptance and commitment therapy (ACT) on psychological indices (stress, quality of life, and coping strategies) among the patients with type II diabetes]. *J Isfahan Med Sch*. 2018;**35**:1859-66. Persian.
  23. Mousavi M, DashtBozorgi Z. [Effect of Acceptance and Commitment Group Therapy (ACT) on the Hardness and Perceived Stress Coefficient Among Patients with Type 2 Diabetes]. *Iran J Health Educ Health Promot*. 2018;**5**(4):311-9. Persian. doi: [10.30699/acadpub.ijhehp.5.4.311](https://doi.org/10.30699/acadpub.ijhehp.5.4.311).
  24. Khashouei MM, Ghorbani M, Tabatabaei F. The Effectiveness of Acceptance and Commitment Therapy (ACT) on Self-Efficacy, Perceived Stress and Resiliency in Type II Diabetes Patients. *Glob J Health Sci*. 2016;**9**(5):18-26. doi: [10.5539/gjhs.v9n5p18](https://doi.org/10.5539/gjhs.v9n5p18).
  25. Pur RA, Ghorbani M. [The effectiveness of acceptance and commitment therapy on stress coping strategies in women with ulcerative colitis]. *Iran J Gastroenterol Hepatol*. 2015;**20**(1):pi-9. Persian.
  26. Hayes SC, Luoma JB, Bond FW, Masuda A, Lillis J. Acceptance and commitment therapy: model, processes and outcomes. *Behav Res Ther*. 2006;**44**(1):1-25. doi: [10.1016/j.brat.2005.06.006](https://doi.org/10.1016/j.brat.2005.06.006). [PubMed: [16300724](https://pubmed.ncbi.nlm.nih.gov/16300724/)].
  27. Babakhanzadeh S, Ahteshamzadeh P, Eftekharsaadi Z, Bakhtiyarpour S, Alipor A. [The effectiveness of Metacognitive Therapy with emphasis for Brain Executive Functions on Cognitive-Attentional syndrome and Sense of Coherence in Anxious persons]. *Couns Cult Psychotherapy*. 2019;**10**(38):195-220. Persian.
  28. Demehri F, Saeedmanesh M, Jala N. [The effectiveness of acceptance and commitment therapy (ACT) on rumination and well-being in adolescents with general anxiety disorder]. *Mid East J Disabil Stud*. 2018;**8**:25-30. Persian.
  29. Ruiz FJ, Hernández DR, Falcón JCS, Luciano C. Effect of a one-session ACT protocol in disrupting repetitive negative thinking: A randomized multiple-baseline design. *Int J Psychol Psychol Therapy*. 2016;**16**(3):213-33.
  30. Mohaddes Shakouri Ganjavi L, Ahadi H, Jomehri F, Khalatbari J. [The Effect of Acceptance and Commitment Therapy on Fasting Plasma sugar and Self-efficacy in women with type 2 diabetes]. *Knowl Res Appl Psychol*. 2021;**21**(4):46-59. Persian.
  31. Rose M, Fliege H, Hildebrandt M, Schirop T, Klapp BF. The network of psychological variables in patients with diabetes and their importance for quality of life and metabolic control. *Diabetes Care*. 2002;**25**(1):35-42. doi: [10.2337/diacare.25.1.35](https://doi.org/10.2337/diacare.25.1.35). [PubMed: [11772898](https://pubmed.ncbi.nlm.nih.gov/11772898/)].