



Effect of the Lazarus' Transactional Model-Based Intervention on Stress Control and Coping in Patients with Type 2 Diabetes



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ABSTRACT

Aims One of the effective factors in preventing the complications of diabetes is stress management. The purpose of this study was to evaluate the effect of an intervention based on Lazarus' Transactional Model on the level of stress in patients with type 2 diabetes.

Materials & Methods This quasi-experimental study was conducted among 80 patients with type 2 diabetes. Stress levels, coping methods, and hemoglobin A1C were evaluated before the intervention and three months afterward. In the intervention group, five training sessions were held based on the strategies outlined in the model. The data were analyzed using analysis of variance, Pearson's correlation coefficient, and analysis of covariance.

Findings The perceived stress score in the intervention group decreased after the intervention. The results of the Pearson correlation test indicated a negative and significant relationship between the stress score and confrontive and optimistic coping strategies. Additionally, there was a positive and significant relationship between the stress score and methods of emotional adaptation and fatalism ($p < 0.001$). Analysis of covariance revealed that, after adjusting for group effects, the intervention had a significant impact on the use of adaptive methods and stress levels ($p < 0.001$).

Conclusion Training and interventions aimed at utilizing coping approaches based on Lazarus' Transactional Model of stress and adaptation is effective in controlling and reducing stress in patients with type 2 diabetes.

Keywords Diabetes Mellitus; Stress, Psychological; Adaptation, Psychological; Problem Solving

CITATION LINKS

[1] Global aetiology and epidemiology of type 2 diabetes mellitus ... [2] Low-and middle-income countries demonstrate rapid ... [3] Diabetes in Iran: Prospective analysis from first ... [4] Global burden of 369 diseases and injuries in 204 countries and ... [5] Standards of medical care in diabetes-2017 ... [6] Prevalence and impact of stress among individuals ... [7] Glycemic control and its relationship with diabetes self-care ... [8] Glycaemic control status among type 2 diabetic patients ... [9] The prevalence of diabetes-specific emotional distress ... [10] Association of stress, depression and anxiety among individuals with microvascular complications ... [11] Healthy coping: Issues and implications ... [12] A randomized controlled trial of acceptance and commitment therapy for type 2 diabetes management ... [13] Stress, appraisal ... [14] Transactional theory and ... [15] Health behavior and health education ... [16] The influence of anger on ethical decision making: Comparison of a ... [17] Effectiveness of interventions based on Lazarus and Folkman transactional model on improving stress appraisal for ... [18] Effect of a transactional model education program on coping effectiveness in women ... [19] A global measure of ... [20] Quality of life and its relationship with stress ... [21] The survey of relationship between perceived stress ... [22] Confirmatory factor analysis of the Jalowiec ... [23] Cultural adaptation, validity, and factor structure of the Jalowiec Coping Scale ... [24] "Perceived stress" and its associated factors among diabetic ... [25] Determining factors affecting fasting ... [26] Health care and patient-reported outcomes ... [27] The intermediary role of self-efficacy in relation with stress, glycosylated haemoglobin and health-related ... [28] Coping styles and self-care behaviors ... [29] Psychological, sociocultural and economic coping strategies of mothers or female caregivers of children ... [30] Stress, coping mechanisms and quality ... [31] Personality and ... [32] Leisure as a resource in transcending negative life events: Self-protection, self-restoration, and ... [33] Coping styles associated with glucose control in individuals ... [34] The effectiveness of stress management training on blood glucose control in patients ...

Introduction

Diabetes is one of the largest global public health concerns, significantly impacting morbidity and mortality. According to estimates from the International Diabetes Federation (IDF) as of 2017, there were 451 million adults living with diabetes worldwide, a number expected to increase to 693 million [1]. However, the prevalence of diabetes is growing more rapidly in low- and middle-income countries [2]. It is estimated that by 2030, nearly 9.2 million Iranians are likely to have diabetes [3].

Due to numerous complications, diabetes reduces both life expectancy and the quality of life for diabetic patients [4]. Nowadays, it is emphasized that a holistic approach should be adopted in managing diabetic patients. In addition to physical health, mental and emotional factors also play a crucial role in controlling diabetes. Addressing psychological disorders can improve self-management of diabetes, reduce complications, and enhance quality of life [5]. Stress is one of the common psychological disorders among patients with diabetes, and individuals with diabetes exhibit significantly higher stress levels compared to the general population [6].

Some studies indicate that the prevalence of stress in patients with type 2 diabetes is high, and individuals with elevated stress levels tend to have poorer diabetes control indicators [7, 8]. Approximately 25% of people with type 2 diabetes are believed to experience high levels of stress, particularly among those who are treated with insulin [9]. Stress is a significant factor in the development of diabetes complications, and its management is crucial for preventing these complications. Some studies have shown an association between retinopathy, nephropathy, and neuropathy with stress and depression [10].

Healthy coping is recognized as one of the essential self-care behaviors for diabetes management and should be incorporated into the care and education programs for diabetic patients [11]. In addition to reducing stress and improving blood sugar levels, effective coping methods positively influence self-care behaviors in diabetic patients. Therefore, promoting and teaching coping strategies to these patients is particularly important [12].

According to Lazarus and Folkman's coping theory, an individual's response to any stressor is processed through primary and secondary appraisal, leading to the selection of coping strategies to address the stressor [13]. The transactional model of stress and coping describes coping as a process involving cognitive and behavioral responses utilized by the individual in reaction to the stressor. This model identifies two main coping strategies, including problem-focused coping and emotion-focused coping [14]. Problem-focused coping is an active strategy that involves behaviors aimed at managing the problem, while emotion-focused coping involves managing the

emotions associated with a stressor [15]. One of the key factors in the appraisal and perception of stress is the sense of one's ability to overcome stressful factors and manage emotional responses, which is addressed under the concept of self-efficacy in the transactional model of stress [16].

The results of previous studies indicate that educational interventions based on models, such as the Lazarus model have been effective in reducing stress in certain chronic diseases, including dialysis patients and patients with multiple sclerosis [17, 18]. Due to the complex nature of diabetes, its numerous complications, and significant lifestyle changes, these patients often experience high levels of stress. Therefore, training in effective coping methods can positively impact stress reduction, improve compliance with medical recommendations, and facilitate lifestyle modifications for these patients. Given that there have been limited studies on the impact of stress reduction using the approach introduced in the Lazarus model for patients with type 2 diabetes, the aim of this study was to investigate the effectiveness of an educational intervention based on the Lazarus model to enhance the ability to cope with stress and teach appropriate coping strategies for reducing perceived stress in patients with type 2 diabetes.

Materials and Methods

Study design and population

This quasi-experimental study, conducted in the summer of 2020, aimed to evaluate the effect of an educational intervention based on the Lazarus and Folkman transactional model on the stress levels of diabetic patients in Anar city, located in central Iran. The study population included all patients with type 2 diabetes who had medical records at the diabetes clinic in the city. In the first stage, all 200 individuals with type 2 diabetes who met the entry criteria and consented to participate in the project were assessed for their level of perceived stress using the Perceived Stress Questionnaire. Considering $\alpha=5\%$, power=90%, and based on $d=3$ and $\sigma=3.97$, as well as based on previous studies [18], a sample size of 36 individuals was estimated for each group. Due to the possibility of attrition, 82 individuals with higher perceived stress scores were included in the study, and randomly assigned to the intervention ($n=40$) and control ($n=42$) groups based on their file numbers available at the diabetes clinic (Figure 1).

Inclusion and exclusion criteria

The inclusion criteria included individuals with type 2 diabetes who were being treated with insulin, had at least one year of diabetes history, and possessed a minimum level of reading and writing literacy sufficient to understand and complete the questionnaire. These patients had no history of acute mental disorders or physical activity restrictions related to diabetes complications.

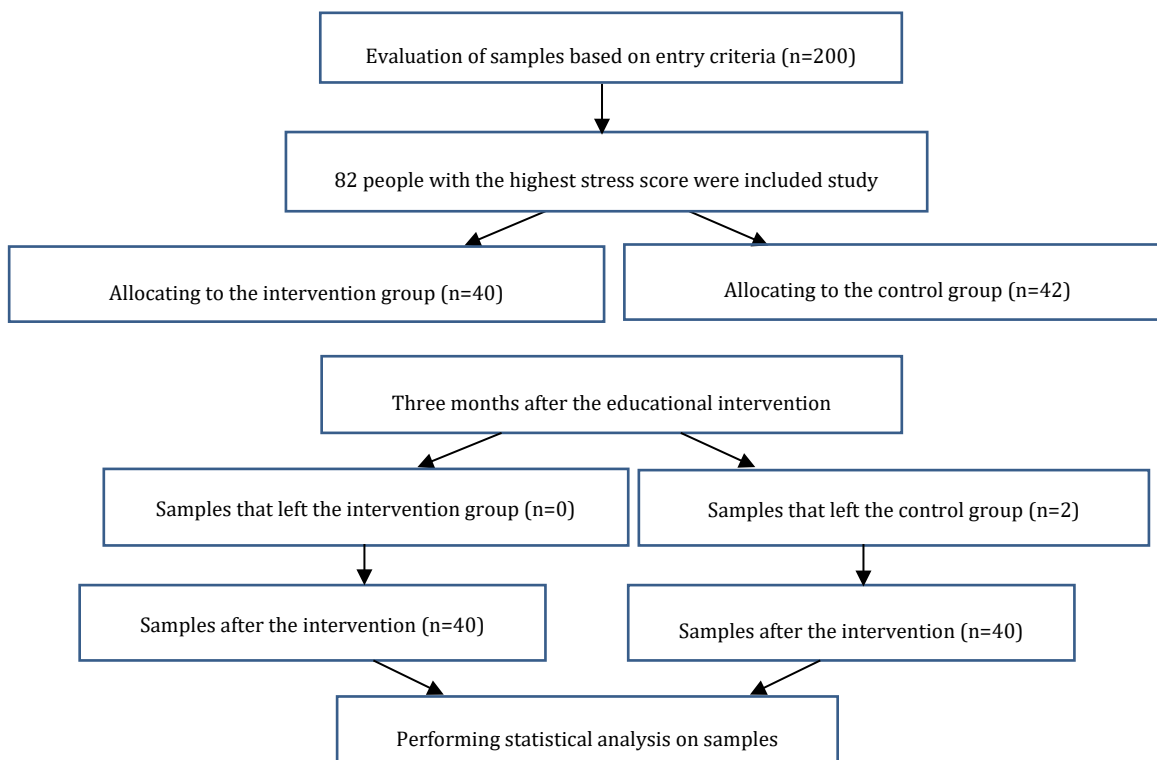


Figure 1. CONSORT diagram

Individuals who experienced major stressful events in the three months prior to the start of the study or during the study, such as the loss of loved ones or financial bankruptcy, as well as those who did not participate regularly in the training sessions, were excluded from the study.

Measures

The Cohen Perceived Stress Scale (PSS) assessed life stressors experienced during the past month to evaluate stress levels [19]. This self-report tool consists of 14 items. In this scale, individuals are asked to indicate on a five-point scale from zero (never) to four (always) how they felt most of the time during the last ten weeks. After reverse scoring for some items, the overall PSS score is obtained by summing the scores of all items for each individual. Total scores range from 0 to 56. The validity of this questionnaire has been confirmed through factor analysis, structural analysis, and content analysis [20]. The reliability of this tool in the Iranian population has been established in studies, such as the one conducted by Asghari *et al.* [21].

To examine coping strategies, the Jalowiec Coping Strategies Scale, which was designed based on the Lazarus coping strategies model, was utilized. The validity and reliability of this scale have been confirmed [22]. This questionnaire has also been translated into Persian in Iran, and its validity and reliability have been examined and confirmed [23]. The scale consists of 60 questions that evaluate coping behaviors and encompasses eight coping styles, including confrontive (ten items), evasive (13 items), optimistic (nine items), fatalistic (four items),

palliative coping (seven items), supporting (seven items), and self-reliant (seven items). Among these eight subscales, confrontive and self-reliant coping styles are considered problem-oriented coping strategies. The total score for the scale ranges from 0 to 180, and the score for each coping style is determined by summing the scores of the items related to that style. There is no definitive classification of these strategies into adaptive or maladaptive categories. Coping styles, such as evasive, fatalistic, and emotive may be considered maladaptive, while confrontive and optimistic coping strategies can be categorized as adaptive. In both groups, hemoglobin A1C levels were evaluated before the intervention and three months after the intervention.

Procedure

The perceived stress levels and coping methods used in both groups were evaluated before the intervention. Subsequently, the experimental group participated in five training sessions in groups of 20 people, which included lectures, group discussions, and question-and-answer segments. The content of the educational sessions was as follows:

Session 1: Introduction of the framework and objectives of the educational sessions, understanding the concept of stress, and enhancing self-efficacy to influence the secondary appraisal of stress.

Session 2: Instruction on problem-solving, conflict resolution, and self-management in dealing with stress.

Session 3: Teaching positive emotion-oriented methods such as optimism, positive thinking, gaining

social support, and engaging in activities like listening to music and walking to reduce the effects of stress.

Session 4: Education on avoiding negative emotion-oriented methods such as avoidance, denial, despair, and the use of sedatives and drugs.

Session 5: Familiarization with positive emotion-oriented methods, including deep breathing exercises, relaxation techniques, yoga, and sports activities to effectively manage stress.

In addition to the training sessions, a virtual group was formed for the patients, allowing them to ask questions related to diabetes. Educational materials were also provided regarding exercise methods and relaxation techniques. The control group received only the routine interventions offered by the diabetes clinic. Data were collected and analyzed within three months after the intervention. The analysis was conducted using SPSS version 19, employing descriptive and analytical statistical methods, including paired t-tests, Student's t-tests, analysis of variance, and Pearson's correlation coefficient.

Findings

The average age of the participants was 36.2±11.2 years. The two groups were homogeneous in terms of

demographic characteristics. The majority of the participants were married (88.75%). Regarding education level, 21 participants (26.25%) had a diploma, and in terms of income level, 31.25% of the participants reported a low monthly income. An examination of the stress scores in relation to demographic characteristics revealed no significant differences based on factors, such as gender, marital status, income level, and duration of illness (Table 1).

Table 1. Comparison of mean perceived stress scores according to demographic characteristics in the studied population

Parameter		Frequency	Perceived stress score	p-Value
Gender	Male	37(46.25)	21.83±6.41	0.758
	Female	43(53.75)	23.86±6.22	
Marital status	Married	71(88.75)	22.80±6.12	0.11
	Single	9(11.25)	23.88±8.29	
Education	Primary	34(42.5)	26.26±6.74	0.67
	Secondary school	14(17.5)	26.71±5.97	
	Diploma	21 (26.25)	24.28±6.00	
	University	11 (13.75)	25.27±8.79	
Economic status	Low	25(31.25)	25.00±6.04	0.52
	Moderate	39(48.75)	26.74±6.49	
	Good	16(19)	24.40±8.23	
Duration of diabetes (year)	<10	36(45)	23.33±6.86	0.87
	11-20	41(51.25)	22.56±5.86	
	21-25	3(3.75)	23.00±8.66	

Table 2. Examining the relationship between stress score and coping methods in the population

Parameter	9	8	7	6	5	4	3	2	1
1- Confrontive	-0.282*	-0.169	0.375**	0.195	-0.394**	0.422**	0.037	-0.049	1
2- Evasive	-0.026	0.108	0.038	0.011	0.265*	0.192	-0.034	1	
3- Supporting	0.052	-0.078	0.022	-0.084	0.100	-0.100	1		
4- Palliative	-0.105	-0.052	0.332**	0.158	0.017	1			
5- Fatalistic	0.317**	0.353**	-0.374**	-0.110	1				
6- Self-reliant	-0.140	-0.147	-0.127	1					
7- Optimistic	-0.265*	-0.160	1						
8- Emotive	0.385**	1							
9- Stress score	1								

* Correlation is significant at the 0.05 level (2-tailed); ** Correlation is significant at the 0.01 level.

The results of the Pearson correlation test indicated a negative and significant relationship between the stress score and both confrontive and optimistic coping strategies. Additionally, there was a positive and significant relationship between the stress score and emotional adaptation and fatalistic methods. No significant relationship was found between other adjustment methods and the stress score (Table 2).

The perceived stress score in the intervention group decreased after the intervention. Furthermore, the scores for self-reliance adaptation methods and problem-oriented methods improved. The average scores for optimistic, supportive, and palliative adaptation methods were also higher in the intervention group following the intervention. In contrast, the intervention group utilized emotional, fatalistic, and evasive methods to a lesser extent (Table 3).

To compare coping strategies, stress scores, and HbA1c levels between the two groups, a one-way

analysis of covariance was employed. Utilizing this analysis requires adherence to certain assumptions, which were examined prior to conducting the test. To assess the normality of the data distribution, the Kolmogorov-Smirnov test was employed. Given that the significance levels of the parameters in this test were above 0.05, it can be concluded that the data distribution was normal.

Additionally, Levene's test was used to examine the homogeneity of error variance of the research parameters between the two groups. Since the significance level of the F statistic was calculated to be greater than 0.05, it can be stated that the error variances of the groups were equal, and no significant differences were observed between them. Considering the significance of the F statistic at a level of less than 0.001, it can be concluded that, after adjusting for the group effect, the two groups exhibited a significant difference in terms of the study parameters (Table 4).

Table 3. Comparison of mean scores of stress coping methods and HbA1c and stress values in two groups before and after the intervention

Parameter	Group	Before intervention	After intervention
Confrontive	Intervention	22.65±3.95	27.77±2.42
	Control	21.42±4.44	21.72±4.32
Self-reliance	Intervention	16.92±2.10	19.00±1.48
	Control	16.97±2.23	16.15±1.81
Optimistic	Intervention	20.90±3.01	21.67±0.99
	Control	19.97±2.89	19.37±2.08
Fatalistic	Intervention	4.45±2.12	2.70±1.34
	Control	3.77±1.95	3.80±1.88
Emotive	Intervention	6.80±2.85	3.40±1.76
	Control	4.30±2.74	4.55±2.50
Palliative	Intervention	7.85±2.98	10.50±1.70
	Control	7.37±2.53	6.02±2.08
Supportive	Intervention	8.20±2.32	10.12±1.74
	Control	8.05±2.12	7.20±2.07
Evasive	Intervention	23.22±5.17	17.30±3.84
	Control	22.00±3.94	22.12±3.19
Emotional coping	Intervention	71.42±9.15	65.72±5.95
	Control	65.47±6.34	63.07±5.36
Problem-oriented coping	Intervention	39.57±4.73	46.77±3.00
	Control	38.40±5.44	37.87±5.17
HbA1c levels	Intervention	8.15±1.42	7.69±1.51
	Control	7.76±1.36	7.84±1.43
Stress	Intervention	25.17±7.25	13.47±4.73
	Control	26.20±6.11	29.25±5.57

Table 4. Results of analysis of covariance to investigate changes in the coping styles, stress, and HbA1 in two groups

Parameter	DF	Mean square	F	p-value
Confrontive	Group	1	1358.423	506.158 <0.0001
	Pre-test	1	382.223	142.419 <0.0001
	Error	77	2.684	-
Self-reliant	Group	1	151.692	108.857 <0.0001
	Pre-test	1	13.217	9.484 <0.0001
	Error	77	1.393	-
Optimistic	Group	1	73.080	55.126 <0.0001
	Pre-test	1	106.071	80.011 <0.0001
	Error	77	1.326	-
Fatalistic	Group	1	249.492	206.700 <0.0001
	Pre-test	1	99.834	82.710 0.004
	Error	77	1.207	-
Emotive	Group	1	457.318	313.750 <0.0001
	Pre-test	1	164.916	113.143 <0.0001
	Error	77	1.207	-
Palliative	Group	1	93.960	101.403 <0.0001
	Pre-test	1	210.882	227.586 <0.0001
	Error	77	62.08	-
Supporting	Group	1	110.317	93.033 <0.0001
	Pre-test	1	171.844	144.920 <0.0001
	Error	77	1.186	-
Evasive	Group	1	375.475	106.014 <0.0001
	Pre-test	1	469.661	132.607 <0.0001
	Error	77	3.542	-
HbA1	Group	1	2.578	13.367 00.1
	Pre-test	38	4.26	22.096 <0.0001
	Error	40	0.193	-
Stress score	Group	1	3234.644	641.043 <0.0001
	Pre-test	23	78.780	15.613 <0.0001
	Error	55	5.046	-

Discussion

This study aimed to evaluate the effect of interventions based on Lazarus's transactional model of stress and coping on the ability of diabetic patients to cope with stress. In the present study, no significant relationship was found between gender and stress score, which is consistent with some studies in this field [24, 25]. Regarding the relationship

between stress and gender in diabetic patients, contradictory results have also been reported; for example, some studies indicate that men exhibit fewer signs of diabetes-related stress than women [26]. Such differences may be partially attributed to varying levels of social support for women in different societies, as well as the different nature of stress measurement tools. It appears that, regardless of demographic characteristics, diabetes, as a chronic disease, is a leading cause of increased stress levels in this group.

The effect of interventions based on the Lazarus model on the stress levels of patients in the intervention group was the most significant finding of the study. The effectiveness of this approach in controlling stress has been acknowledged by some patients. For instance, the application of this model to hemodialysis patients and patients with myasthenia gravis has been associated with a reduction in stress levels [17, 18]. However, the impact of the intervention based on the Lazarus model on the stress levels of diabetic patients has not been previously investigated. According to Lazarus's model, stress results from two types of evaluation, namely primary evaluation and secondary evaluation. In the secondary evaluation, individuals should develop the belief and self-efficacy that enable them to overcome stress. In the present study, efforts were made to improve self-efficacy to contribute to stress control. This goal was achieved through various measures, such as verbal persuasion and behavioral facilitation. Alipour *et al.* indicate that self-efficacy is an important mediating factor that can help diabetic patients cope with stress and improve their quality of life [27].

In this study, the interventions increased the use of confrontive coping methods to deal with stress. Additionally, the results showed a significant correlation between exposure methods and stress control; that is, with any increase in the use of exposure methods, stress levels decreased proportionally. Similarly, Hamadzadeh *et al.* demonstrated that the application of confrontive methods is associated with an increase in self-care behaviors among diabetic patients [28].

The self-reliant strategy increased after the intervention in this study; however, no significant correlation was observed between the use of this strategy and perceived stress. Some studies suggest that excessive reliance on this strategy may lead individuals to be less likely to seek social support and advice from others, which can, in turn, result in social withdrawal and increased stress [29]. The use of fatalistic coping styles decreased after the interventions, and there was an inverse relationship between the use of this style and stress. The findings of the present study were consistent with those of Soponaru *et al.*, who found that hemodialysis patients using fatalistic coping strategies experience higher stress levels and lower quality of life [30]. Based on the

results, the use of supportive coping methods increased in the intervention group. Since family members were invited to join groups on social media in the present study, an increase in emotional and informational support is also likely.

In the present study, the use of emotive coping mechanisms was reduced in the intervention group. According to the questionnaire, negative emotion-oriented methods, such as anger, self-blame, and violence, were identified as emotional coping methods. During the training sessions, it was emphasized that these methods should not be used. Exercise and palliative techniques were introduced and recommended as emotion-oriented coping methods in this intervention. Some studies suggest that exercise can not only emotionally modulate the effects of stress but also help individuals find appropriate solutions to problems and control stress levels when necessary^[31,32].

The results showed that teaching effective ways to cope with stress based on the Lazarus model reduced the level of HbA1c in the intervention group. This finding is consistent with those of similar studies in this field. Similarly, Murakami *et al.* demonstrated that adaptive coping methods are associated with a decrease in HbA1c levels^[33]. In the present study, no significant correlation was observed between the stress score and the level of HbA1c, which is inconsistent with the findings of other studies^[34]. The inconsistent results may be attributed to differences in stress measurement procedures. It seems that physiological measurements of stress can more accurately reveal this relationship.

The present study is one of the few investigations into the effect of stress-coping training and interventions based on Lazarus's coping model on stress levels in patients with type 2 diabetes. However, this study faced some limitations, such as coinciding with the COVID-19 pandemic. Although some face-to-face training sessions were held in compliance with protective protocols, follow-up on patients' issues and solutions to their problems were primarily conducted via social media. In this study, emotion-oriented and problem-oriented coping strategies were taught to the intervention group simultaneously, which did not allow for a comparison of the effects of each method on the stress score. Therefore, researchers are advised to evaluate the effects of the two methods using multi-group approaches. Adaptive problem-oriented coping methods can lead to a reduction in stress levels, while negative emotion-oriented methods can result in increases in stress levels. It is suggested that, by taking into account individuals' problems and their level of access to support resources, attention should be given to positive emotion-oriented methods such as optimism, positive thinking, seeking support, and exercise as emotion-oriented solutions for these patients. Additionally, due to the complex nature of

diabetes, familiarity with problem-solving methods and processes can help patients cope with stress.

Conclusion

The intervention based on the coping model of Folkman and Lazarus is effective in managing stress in patients with type 2 diabetes.

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Ethical Permissions: This study was conducted in accordance with the principles of the Helsinki Declaration. It was approved by the Ethics Committee of Rafsanjan University of Medical Sciences under the ethics code IR.RUMS.REC.1399.065. The purpose of the study was explained to all participants and informed written consent was obtained from them.

Conflicts of Interests: The authors reported no potential conflicts of interests to declare.

Authors' Contribution: Miraki MR (First Author), Introduction Writer/Methodologist/Assistant Researcher/Discussion Writer (25%); Nasirzadeh M (Second Author), Introduction Writer/Methodologist/Assistant Researcher/Discussion Writer (20%); Sayadi AR (Third Author), Introduction Writer/Methodologist/Assistant Researcher/Statistical Analyst (15%); Abdolkarimi M (Fourth Author), Introduction Writer/Methodologist/Assistant Researcher/Discussion Writer/Statistical Analyst (40%)

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