

## Yoga-based Mindfulness Training as an Intervention for the Reduction of Symptoms of Anxiety and Depression in Children and Adolescents with Type 1 Diabetes

Sara Jahandarpour<sup>1\*</sup>, Mohammad Reza Sobhani<sup>1</sup>

<sup>1</sup>M.Sc. in Clinical Psychology, Department of Psychology, Shiraz Branch, Islamic Azad University, Shiraz, Iran.

### Abstract

**Objective:** Yoga has also been implemented in healthcare institutions to manage disease-sequelae, including pain, anxiety, depression, fatigue, and insomnia. In this study, we aimed to evaluate the effect of Yoga-based mindfulness training on anxiety and depression in adolescents with type 1 diabetes (T1D) at clinics of the Shiraz University of Medical Science.

**Materials and Methods:** This study was conducted via a quasi-experimental method pretest-posttest design on 10-17 years old subjects with T1D, Shiraz, Iran, in 2019-2020. Twenty patients were randomized to the education group (n=10) and the control group (n=10). Data collection tools included the depression, anxiety, and stress scale (DASS-21). The group training intervention was done for the experimental group (ten weeks, 45 minutes every week) without training for the control group. Three months after the training, two groups filled questionnaires. Data were analyzed by multivariate analysis of covariance (MANCOVA) using SPSS- 22 software.

**Results:** The findings revealed a significant reduction in the mean anxiety level of patients in the intervention group before and after intervention ( $P < 0.05$ ). Furthermore, following group training, there was a significant change in the mean of depression and stress among the patients in the intervention group ( $P < 0.05$ ).

**Conclusion:** Yoga-based mindfulness training was found to improve depression and anxiety in T1DM adolescents. As a consequence, including training sessions in the appropriate care plans would be advantageous.


**Keywords:** Yoga training, Anxiety, Depression, Stress

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#### Corresponding Author:

**Sara Jahandarpour**, M.Sc. in Clinical Psychology, Department of Psychology, Shiraz Branch, Islamic Azad University, Shiraz, Iran.

**Tel:** (98) 917 105 5242

**Email:** Sarajahandarpour@gmail.com

**Orcid ID:** 0000-0002-2274-142X

## Introduction

The most frequent metabolic-endocrine condition in children is type 1 diabetes (T1D) (1,2). Diabetes affects an increasing number of people each year, the global prevalence of the illness is predicted to reach 592 million by 2035, with a quicker increase in poor and emerging nations. According to data published in several regions worldwide, the prevalence of T1D in children and adolescents is increasing (3). Approximately 10% of all Iranian adolescents and 42% of overweight adolescents meet the metabolic syndrome criteria, indicating that one out of every ten adolescents develops diabetes (4).

Adolescents with diabetes encounter significant psychological challenges. Anxiety disorders and heightened anxiety feelings were observed to be widespread in diabetic individuals. Adolescents with diabetes have a significant frequency of anxiety symptoms as well (2). Anxiety symptoms were shown to be prevalent in 29.7% of adolescents and adults with diabetes in research. According to a study, half of the adolescents with T1D experience both general and diabetes-specific stress, which diabetes-specific stress includes higher HbA1c, lower self-management activities, and lower quality of life (3). Rosami et al. (2016), Nguyen et al. (2021), and Hadiyan (2018) have reported anxiety in diabetes children and adolescents in the literature (5-7). Meta-analytic research that comprised 22 studies demonstrated that children with DM have higher levels of depression, anxiety, and psychological distress than their peers (7,8).

In patients with DM, Herzer and colleagues (9) found a link between the development of depression and anxiety, indicating that they often emerge together. In addition to medical assessment and treatment, mental screening is recommended to become a standard element of clinical practice guidelines in children and adolescents with DM, given the overall

frequency and potential severity of mental health comorbidities.

Depressive symptoms have been linked to the development or maintenance of insulin resistance, a crucial physiological antecedent of T1D, in observational studies of children and adults. Similarly, depressed symptoms predict the occurrence of T1D in children and adults, accounting for obesity. While the exact processes are unknown, it has been proposed that depressed symptoms enhance stress-related behaviors and modify stress physiology, promoting insulin resistance regardless of calorie balance. Given the substantial psychosocial stress experienced by adolescents at risk for T1D (10), identifying, preventing, and treating anxiety is crucial to delivering comprehensive diabetes care. This review summarizes the studies on anxiety in children and adolescents with T1D, as well as makes recommendations for future research and therapeutic implications.

Many types of psychotherapy can assist people in identifying harmful habits and cognitive patterns that can lead to sadness and anxiety. Cognitive-behavioral therapy is one of the most well-known types of psychotherapy, in which patients learn to replace negative thought patterns with more useful and productive ones. It also helps sad and nervous people make beneficial behavioral adjustments (11).

Yoga and these forms of therapy have certain parallels. Yoga, like psychotherapy, is a behavioral intervention that can be adjusted to an individual's requirements and may be used to reduce rumination and promote behavioral change (12). There are other Yoga techniques in which individuals analyze their "observances" better to understand well-being (12). This awareness should be reflected in all aspects of one's life and maybe cultivated and used at home. This is one of the properties of Yoga that distinguishes it from other forms of therapy. It's a self-administered technique that may be used as much as needed at home.

Yoga's accessibility makes it a one-of-a-kind treatment with almost limitless applications. On the other hand, systematic studies have found substantial evidence of Yoga's beneficial benefits on stress management and burnout prevention among healthcare workers (13,14), indicating that it may be included in workplace health promotion in healthcare settings (15,16).

Another age-old method that has gotten much attention in recent years, similar to Yoga, is mindfulness. Mindfulness is an old Buddhist practice that stresses paying attention to the present moment, accepting internal experiences, and being nonjudgmental (15). Mindfulness has been shown to have good impacts on mental health, including improved coping and self-compassion, and a reduction in stress, anxiety, sadness, and obsessions (17). The Based-Mindfulness Interventions (MBIs) were designed with clinical populations in mind, but multiple studies have shown that they increase cognitive function and emotional reactivity in nonclinical populations (13). The data that both mindfulness and Yoga training have altered individual brain networks and integrated brain states and brain-body interactions support the inclusion of mindfulness and Yoga training in our intervention.

Furthermore, both of these time-honored techniques might be considered synergistic in terms of their impact on body and mind states, particularly posture, breath, the autonomous nervous system, and the primary brain networks involved in cognition and emotion regulation (17). As a result, the primary goal of this study is to use Yoga-based Mindfulness Training as an intervention to reduce anxiety and depression symptoms in children and adolescents with T1D.

## Materials and Methods

This study was conducted via a quasi-experimental method pretest-posttest design on adolescents 10-17 with T1D, Shiraz, Iran, in 2019- 2020. Twenty patients were randomized to the education group (n=10) and

the control group (n=10). Due to the unknown sample size, Cohen's sampling formula was used. The group training intervention was done for the experimental group (ten weeks, 45 minutes every week) without training for the control group. Three months after the training two groups filled out questionnaires. This research included participants that were diagnosed with diabetes for at least three months. The study's exclusion criteria included having undergone training in the previous seven months or current involvement in any Yoga-based mindfulness training, as well as a history of anti-depressant or anxiety medication. Participants with chronic health issues other than diabetes were also excluded from the diabetes clinic participants were picked for it based on convenience and purposeful sampling when they were assigned to it (secondary care). The participants were then randomly assigned to the intervention and control groups based on odd and even numbers.

The participants in this study were two groups of children and adolescents with T1D from regions 6 and 3 in Shiraz, Iran. The groups were chosen based on the inclusion and exclusion criteria, and one of the criteria for participation in this study was that a permission form was completed and provided in the event of willingness to participate in the research and training process. Moreover, those who did not wish to participate in this study were removed owing to a lack of informed consent. Both groups were measured twice. The first assessment was taken before the intervention using appropriate questionnaires to assess depression, anxiety, and stress, and the second measurement was taken after Yoga-based mindfulness training Table 1. (19).

## The Depression, Anxiety and Stress Scale (DASS-21)

The DASS was created by Lovibond and Lovibond in 1995 to assess the negative emotional states of sadness, anxiety, and stress (20). There are 42 items in this self-report

questionnaire (depression, anxiety, and stress each contained 14 items). Participants were asked to rate how much each item had affected them in the preceding week on a 4-point scale: did not apply to me at all (score= 0), applied to me to some degree, or some of the time (score= 1), applied to me to a large degree, or a considerable percentage of the time (score= 2), and applied to me very much, or most of the time (score= 3). The three measures had a total score ranging from 0 to 42, with higher numbers indicating more sadness, anxiety, and stress. Lovibond and Lovibond have validated the validity and reliability of DASS. Internal consistency (Cronbach's alpha) for the DASS depression, anxiety, and stress measures were 0.91, 0.84, and 0.90, respectively, in the normative sample. Cronbach's alpha values were also observed to be above 0.82 for the three subscales and 0.94 for the entire DASS scales in another investigation (21). DASS's test-retest reliability was likewise acceptable (0.90). The test-retest reliability of the Persian version of DASS was also validated ( $r=0.92$ ), as measured by the Pearson correlation coefficient (22).

### Ethical considerations

This article is extracted from the research plan with the code of ethics approved by IR.IAU.SMU.REC.1399.069 from the research ethics committee of Shiraz University of Medical Sciences. All those who contributed to this research are appreciated and thanked.

In order to ensure that the data in this study meets the underlying assumptions of covariance analysis, the linearity assumptions and the normality of the distribution were examined ( $P= 0.05$ ). Also, the measurement of the associated variable without error was observed in completely controlled conditions. The assumptions of homogeneity of variance and homogeneity of variance-covariance matrices were also examined.

### Results

The mean age of the participants was 14.6 ( $\pm 1.8$ ) years, with an A1c of 8.4 ( $\pm 1.4$ ) percent and a disease duration of 5.7 ( $\pm 3.8$ ) years. Baseline Anxiety ( $20.40 \pm 2.34$ ), Depression ( $11.13 \pm 1.34$ ) and Stress ( $31.53 \pm 3.46$ ) scores were not baseline differently different between the interventions and the control groups ( $21.13 \pm 2.31$ ), ( $11.60 \pm 2.31$ ), and respectively ( $P < 0.05$ ). In the posttest, the result of covariance analysis adjusted for the baseline Anxiety, Depression and Stress scores showed that scores significantly improved in the interventions ( $13.23 \pm 1.87$ ), ( $8.23 \pm 2.17$ ), and ( $16.60 \pm 2.63$ ) respectively compared to the control groups ( $21.03 \pm 2.12$ ), ( $10.93 \pm 2.12$ ), and ( $29.93 \pm 3.12$ ) respectively.

All four relevant multivariate statistics (Pillay effect= 0.106, Wilkes lambda= 0.063, hotelling effect= 13.257, and largest zinc root= 13.257) were found to be significant at level  $P=0.0001$ . In other words, at least in terms of one of the dependent variables, there is a significant difference between the subjects who received the interventions (experimental groups) and the subjects who did not receive the interventions (control group) in the post-test stage.

The univariate test result is significant for each dependent variable ( $P=0.0001$ ), and the mindfulness training package has a significant effect on the three dependent variables of anxiety ( $F_{3, 23}= 132.02$ ), depression ( $F_{3, 23}= 19.12$ ) and stress ( $F_{3, 23}= 119.76$ ).

### Discussion

Yoga and mindfulness have both been shown to positively affect mental and physical health (14-16). Hunt et al. showed in their study that the effects of Yoga centered on coping well with stress reduced negative affect in the short term, and resulting in higher (more adaptive) heart rate variability (19). Besides assessing how yoga may promote the physiological and mental impacts of children and adolescents with asthma, the review study evaluated the effectiveness of Yoga and mindfulness training programs in determining

**Table 1. Yoga-based mindfulness training (19)**

<b>Session 1</b>	Creating a safe and reliable environment for the group to increase mindfulness. Abdominal and deep breathing, related explanations, and its importance. Teaching the concept of mindfulness and the difference between conscious attention and normal attention to the child. Motivate children to do homework In this session, children are introduced and introduced to each other. After that, the concept of mindfulness and why they are in this group are discussed. In addition, children become more familiar with the benefits of this educational-therapeutic method with the help of exercises such as the discovery of consciousness, Yoga movements.
<b>Session 2</b>	Increase awareness of the challenges ahead to practice mindfulness exercises and discover reasons to "be in the world." Deep breathing, lotus position, and stretching movements also prepare the body to start Asana with a focus on inhaling and exhaling, archery, and bridge movement. Introduction of mindfulness of breathing, mindfulness of senses as well as mindfulness of body movements.
<b>Session 3</b>	In this session, children become more familiar with their thoughts, feelings, and body senses through exercises such as mindfulness, better understand the difference between them, and become more aware of the effects of these three components on their life experiences.
<b>Session 4</b>	Increasing awareness that we all have thoughts, feelings, and physical senses, but these are not true. Deep breathing, lotus position, and stretching movements to prepare the body to start Asana with a focus on inhaling and exhaling, type I warrior, cat-cow movement. Understand that many of a person's thoughts, feelings, and physical senses affect the realities of their lives, so as people become more aware of their thoughts, feelings, and physical senses, their experiences of life change.
<b>Session 5</b>	Introducing conscious mind listening and increasing awareness of the natural complexity of sounds. Deep breathing of lotus position and stretching movements to prepare the body to start Asana with a focus on inhaling and exhaling, hearing the sound of your inhaling and exhaling, lying in the butterfly position. Familiarity with the fact that different sounds evoke different thoughts, feelings, and body senses in a child, and the observation that the same sounds may evoke different responses in different children.
<b>Session 6</b>	Introduce conscious expression of sounds, and practice using sounds to express emotions. Deep breathing, lotus position, and stretching movements prepare the body to start Asana with a focus on inhaling and exhaling, hearing the sound of inhaling and exhaling, swinging with music, and moving locusts. - Understand those thoughts, too. Emotions and bodily senses affect and are affected by them.
<b>Session 7</b>	Introduce seeing the conscious mind to increase attention and focus. Deep breathing of lotus position and stretching movements to prepare the body to start Asana with a focus on inhaling and exhaling. Learn to distinguish between judging and describing. Children's experiences are shaped by a combination of what they see and the cognitive interpretations that are made about them. Humans automatically judge things in front of them without looking at reality. Doing Yoga exercises, write a case based on seeing judgment.
<b>Session 8</b>	Introducing the conscious mind, practicing conscious attention to the sense of touch, and observing that all people often categorize and label their experiences. Increasing awareness of judgments and how these judgments affect children's perceptions of their touch. Deep breathing, lotus position, and stretching movements to prepare the body to start Asana with a focus on inhaling and exhaling, downward dog, baby position. Seat mode. Deepen the understanding that judging may prevent children from seeing the choices they can make. Doing Yoga Exercises- Concentration Exercises: Concentration exercises involve a technique called trataka. The child should focus on a word or shape, then close their eyes and draw the picture on a piece of paper.
<b>Session 9</b>	Cultivate mindfulness by continuing to practice understanding that thoughts and emotions are not real. They are thinking. Excitement is just excitement and not reality.
<b>Session 10</b>	Supporting children in order to continue the growth of mindfulness and bring more mindfulness into daily life. Stretching movements to prepare the body to start Asana with focus on inhaling and exhaling, flying eagle, warrior type III. Mountain state - Teaching children to be kind to themselves and others in the world. Discover children's personal experiences of the program

enhanced mental well-being and stress-related outcomes, that Yoga results were better (22).

The Yoga program discussed in the study of Chimiklis et al. emphasizes the advantages of

Yoga, mindfulness-based therapies on the outcomes of ADHD symptoms, hyperactivity, and inattention (parent and teacher report), as well as parent-child interaction, executive

**Table 2. Descriptive statistics**

Variables	Groups	Pre-test	Post-test	<i>P</i>
		Mean ( $\pm$ SD)	Mean ( $\pm$ SD)	
Anxiety	Experimental	(20.40 $\pm$ 2.34)	(13.23 $\pm$ 1.87)	0.623
	Control	(21.13 $\pm$ 2.31)	(21.03 $\pm$ 2.12)	0.228
Depression	Experimental	(11.13. $\pm$ 1.34)	(8.23 $\pm$ 2.17)	0.327
	Control	(11.60 $\pm$ 2.31)	(10.93 $\pm$ 2.12)	0.221
Stress	Experimental	(31.53 $\pm$ 3.46)	(16.60 $\pm$ 2.63)	0.212
	Control	(30.13 $\pm$ 3.31)	(29.93 $\pm$ 3.12)	0.454

functioning, on-task behavior, parent stress, and parent trait-mindfulness, according to the effect sizes of eleven research investigations (23). Also, mindfulness-based stress reduction (MBSR) is a technique that is adaptable and customized. Mindfulness meditation and Yoga are the two key components. Mindfulness is practiced in the way that best suits the person, rather than following a script or carrying out painstakingly stated processes (19-23).

Yoga regularly causes continuous contraction and expansion of muscles in performing movements, changing breathing patterns, cultivating attention and mental alertness, strengthening the heart muscle, improving blood circulation, relaxing muscle tension, and relieving stress from the mind, according to the research findings. Depression, anxiety, and stress are examples of negative emotions (24). As a result, Yoga is beneficial for improving general health, nerve function, and physical activity, as well as lowering sadness, anxiety, and aggressiveness, as well as increasing social, emotional, and child skills (25,26), and stress and behavior management (27).

Mindfulness, on the other hand, is useful in lowering anxiety, depression, and stress. Mindfulness activities, as well as certain soothing individual activities such as physical education and exercise, can help reduce stress, depression, aggressiveness, and anxiety symptoms (28). This strategy works on both the emotional and cognitive aspects of anxiety, and by improving the child's capabilities, it can help reduce anxiety and stress by improving mindfulness and assertiveness (29,30).

To explain these results, the treatment for anxiety and depression now consists mostly of

psychological and pharmaceutical therapy; however, mind-body therapies are getting popular as a technique of reducing stress in individuals. Yoga, a type of mind-body exercise, is becoming a more popular treatment for maintaining wellbeing and treating a variety of health problems and disorders. Yoga should be considered as a complementary therapy or alternative method for medical therapy in the treatment of stress, anxiety, depression, and other mood disorders as it has been found to promote emotions of well-being, reduce irritation, boost self-confidence and body image, enhance efficiency, enhance interpersonal interactions, boost attention, and inspire a positive attitude on life. Yoga encourages personal development, health, and happiness. Mind-body fitness programs (such as Yoga) can help people achieve serenity, tranquility, and better completeness and integration in their life by recognizing the interconnectedness of mind, body, and spirit. Yoga's potential as a significant component of a personal wellness plan should be recognized by health care providers, health educators, and others.

Randomization and the use of clinical samples were the strengths of this study. Limitations of the present study include the small sample size and the lack of follow-up assessment and the use of non-random sampling. In addition, given the pilot nature of the study, whether any improvements in stress or health may have been maintained over time is unknown.

## Conclusions

Our results indicate that Yoga-based mindfulness training might be a moderately

effective intervention in alleviating children and adolescents with T1D and mental distress. It is recommended that demographic variables be examined in future studies and that the effectiveness of the approach be compared for gender and age.

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### Conflict of Interest

There were no reports of potential conflicts of interest authors.

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