

# Effectiveness of Mindfulness-Based Cognitive Rehabilitation in Reducing Stress among Hard of Hearing Adolescent Girls

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## Abstract

**Introduction:** This study was conducted to determine the effectiveness of mindfulness-based cognitive rehabilitation for stress reduction in hard of hearing adolescent girls.

**Method:** In a randomized clinical trial, 24 hard of hearing adolescent girls were randomly assigned to either the intervention or the control group. The intervention group received the mindfulness cognitive rehabilitation intervention over 12 weeks, one session per week. This is while the control group did not receive any intervention. Perceived Stress Scale (PSS) and Mindful Attention Awareness Scale (MAAS) were completed by adolescent girls to evaluate their stress levels during the baseline, pre-test, post-test, and follow-up periods of the intervention.

**Results:** A repeated-measure, analysis of variance (ANOVA) demonstrated that the mean levels of stress in the intervention group decreased after the mindfulness training. Also, the analysis revealed that the mean levels of stress between the intervention group and the control group were significantly different ( $p < 0.01$ ).

**Conclusion:** The findings demonstrated that mindfulness intervention could alleviate the stress of hard of hearing adolescent girls.

**Keywords:** Adolescent Girl, Cognitive Rehabilitation, Hard of Hearing, Mindfulness, Stress

## Introduction

The World Health Organization (WHO) reported that in 2018, nearly 466 million individuals were affected worldwide with hard of hearing. People affected by hard of hearing experience higher, if not the same, rates of mental ill-being compared to the non-hard of hearing population [1]. Individuals with hard of hearing are usually less able than normal hearing individuals in speech recognition assignments, such as acknowledgment in loud situations, speech prosody, vocal feeling acknowledgment, and talker separation [2]. Research have shown that adolescents with hard of hearing have social problems or are not

accepted by their normal-hearing peers and have been exposed to a variety of behavioral, emotional, and academic disorders. Adolescents, especially girls, with hard of hearing experience a variety of stressors in different spheres of life such as academic performance, dating, and social interactions, which may make them susceptible to psychological problems [3]. One of the psychological characteristics of adolescents with hard of hearing that can be affected by their conditions and problems is stress. The dominance of stress on the body of human personality disrupts the peace of mind and minimizes the power of intelligence, creativity, and initiative, and dramatically reduces the cycle of intellectual production and scientific and professional products [4]. Previous findings revealed that hard of hearing adolescent girls experience higher levels of stress than hard of hearing adolescent boys [5]. This vulnerability is particularly noticeable during adolescence and continues through adulthood [6]. Eschenbeck et al. [7] carried out a study in which they examined the degree to which deaf, hard of hearing, and auditory processing disordered children respond to everyday general stressors, and compared them with their hearing counterparts. They found that stress levels experienced when facing everyday general stressors did not differ between these two groups. They, however, revealed that there was a difference within children with hearing problems because these children found hearing-specific stressors less stressful than everyday stressors. Despite this, it is evident that these individuals deal with stressors that hearing people do not. Therefore, it would be prudent to find a way for people with hearing problems to relieve their stress levels. There are two different methods in dealing with individuals who have little control over stressful situations [8]. One way is to remove or at least reduce the stressor, and the other is to increase their resistance to it. Either of these methods can be followed through various strategies. These strategies are regarded as various forms of cognitive rehabilitation methods based on the cognitive model of stress management, relaxation is also an important way in stress reduction. Mind-body intervention is a method that has been used to reduce the effects of chronic diseases in many countries and is a field that emphasizes the interaction between the brain, mind, body, and behavior and has powerful methods that directly affect physical and psychological health [9]. Meditation is one of the common techniques in this field and mindfulness refers to a meditation that emphasizes the presence and awareness of the present [10]. Mindfulness-based therapy is highly effective in treating some clinical disorders and physical ailments because they address both physical and mental dimensions [11]. Currently, the most common method in mind-body intervention is mindfulness-based therapy. However, mindfulness might be considered as the most effective form of relaxation beside the cognitive rehabilitation method for the reduction of stress [12]. Mindfulness is a cognitive rehabilitation method that is characterized by non-evaluative and sustained moment-to-moment awareness of perceptible mental states and

processes [13]. It is actually a non-deliberative process; it merely implies sustained attention to ongoing mental content without thinking about comparing or in any way evaluating the ongoing mental phenomena that arise during periods of practice [14].

This procedure has been used effectively among patients with a wide variety of chronic clinical ailments, as well as among groups of relatively healthy individuals who attempt to improve their cognitive and emotional abilities to cope with the normal but often significant stresses of daily life. Previous studies reported substantial benefits of mindfulness for individuals suffering from chronic pain [15], fibromyalgia [16], cancer [11], anxiety disorders [17], depression [18], and stress [19–21]. In a study carried out by Wahbeh et al. [22], combat veterans with Posttraumatic Stress Disorder (PTSD), combat veterans without PTSD, and non-combat veterans without PTSD were asked to fill out the Mindful Attention Awareness Scale. The results of their study revealed that the participants of these groups did not significantly differ in mindful awareness. Another study was also carried out by Gonzalez et al. [23] in which they made use of the Mindful Attention Awareness Scale (MAAS) and found that mindfulness attention has a negative association with interoceptive fear, arousal anxiety, and HIV symptom stress. It seems that there is a strong body of research on the relationship between mindfulness and relieving stress, however, to the best of our knowledge, currently, there is no study that has explored the mindfulness intervention for stress reduction in hard of hearing adolescents. Given the positive impact of mindfulness on stress, in the present study, it is hypothesized that mindfulness cognitive rehabilitation reduces the hard of hearing adolescent girls' stress.

## Method

The statistical population of this study included all of hard of hearing adolescent girls in two special schools of Tehran (district five and six) in 2018. The sampling method was convenience so participants included 24 hard of hearing adolescent girls (Mean age=13.83, SD= ±1.53, range of 12-16 years old) from two special schools in Tehran in 2018. Thirty hard of hearing adolescent girls, who met the criteria, were invited to participate in this study, of those recruited, 24 agreed to participate in the study.

The inclusion criteria were age between 12-16 years, enrolled in a special school, formally diagnosed with hard of hearing, and middle socio-economic status. Individuals were excluded from participating in the study if they reported physical illnesses such as heart disease or multiple sclerosis, substance abuse, drug dependence, history of psychoactive drugs usage, psychotic illnesses such as schizophrenia or related disorders, experiences of grief in the last six months such as divorce and close relatives' death, participating in any psychological training parallel to the current study, and missing two sessions. The reasons for exclusion included traveling from different parts of the city (one participant), declining to complete questionnaires (three participants), and lack of interest in continuing participation (two participants).

Demographic variables included age, socio-economic status, father's education status; mother's education status, Degree of Hearing

Loss, cause for hard of hearing, type of device used, and communication mode which are presented in Table 1.

**Table 1. Demographic Characteristics based on Groups**

		Mindfulness-Based Group Therapy (MBGT) (n = 12)		Control (n = 12)		Statistical Analyses
		Frequency	Percent	Frequency	Percent	
age	(mean, SD)	14.23	1.45	13.94	1.23	t(22)=.53, P=60
Socio-economic status	Low	5	41.66	4	33.33	$\chi^2(2)=.66, P=90$
	Average	5	41.66	6	48.78	
	High	2	16.66	2	16.66	
Father's education	High school and less	2	16.66	2	16.66	$\chi^2(2)=0.42, P=93$
	Diploma	5	41.66	6	50.0	
	Bachelor	3	25.00	3	25.00	
	Master degree and higher	2	16.66	1	8.33	
Mother's education	High school and less	1	8.33	1	8.33	$\chi^2(2)=3.33, P=34$
	Diploma	4	33.33	8	66.66	
	Bachelor	6	50.00	3	25.00	
	Master degree and higher	1	8.33	0	0	
Degree of HL	Severe to profound	1	8.33	3	25	$\chi^2(2)=1.22, P=54$
	Moderate to severe	7	58.33	6	50	
	Mild	4	33.33	3	25	
Cause for hard of hearing	Birth/unknown	11	91.66	9	75	$\chi^2(1)=1.3, P=.27$
	Disease	1	8.55	3	25	
Type of device used	None	2	16.66	5	41.66	$\chi^2(2)=1.97, P=.37$
	Hearing aids	8	66.66	5	41.66	
	Cochlear implant	2	16.66	2	16.66	
	Speech	10	83.33	8	66.66	
Communication mode	Speech + sign	2	16.66	3	25	$\chi^2(2)=1.42, P=.49$
	Sign	0	0	1	8.33	

The tools used in this study were as follows:

**Perceived Stress Scale (PSS):** This scale has been developed by Cohen et al.[24] in 1983. It measures an individual's appraisal of their life as stressful (i.e. unpredictable, uncontrollable, and overloading), consisting of 10 items during the last month. Items examples include, "How often have you felt nervous or stressed?". Participants responded to each item using a 5-point scale ranging from 0 (never) to 4 (very often). The coefficient alpha reliability for the PSS was 0.84 [24]. Total scores range from 0 to 40, with higher scores indicating greater overall distress. In the Iranian population, Khalili et al. [25] showed satisfactory reliability and validity for assessing perceived stress and reported 0.85 for Cronbach's alpha coefficient.

**Mindful Attention Awareness Scale (MAAS):** This scale was developed by Brown and Ryan [26] in 2003 and it is a 15-item single-dimension measure of core characteristic of mindfulness, namely, a receptive state of mind in which attention, informed by a sensitive awareness of what is occurring in the present. The MAAS measures the frequency of open and receptive attention to and awareness of ongoing events and experiences. Response options ranged from 1 (almost never) to 6 (almost always). Previous studies reported acceptable internal consistency [27]. In Iran, Mohsenabadi et al. [28] showed that MAAS was a reliable and valuable scale and its Cronbach's alpha was 0.81.

Among Tehran's schools between the academic year of 2018-2019, four schools had announced a partnership to conduct research, however, among them, only two schools had the appropriate space (saloon for exercising sessions and sitting) and scheduling outside school hours, for mindfulness training. A total of 30 hard-of-hearing adolescent girl students were accessible to us after the inclusion and exclusion criteria, and finally, 24 were selected and randomly assigned to either the intervention or control group.

Participants responded to the studies questionnaires four times during the study period, (a) Time 1: Baseline, (b) Time 2: Pre-test and (c) Time 3: Post-test, (d) Time 4: Follow-up. The baseline was conducted one week before the pre-test. The pre-test was conducted when the intervention had started. The post-test was conducted 12 weeks after the pre-test and, the follow-up was conducted two months after the post-test.

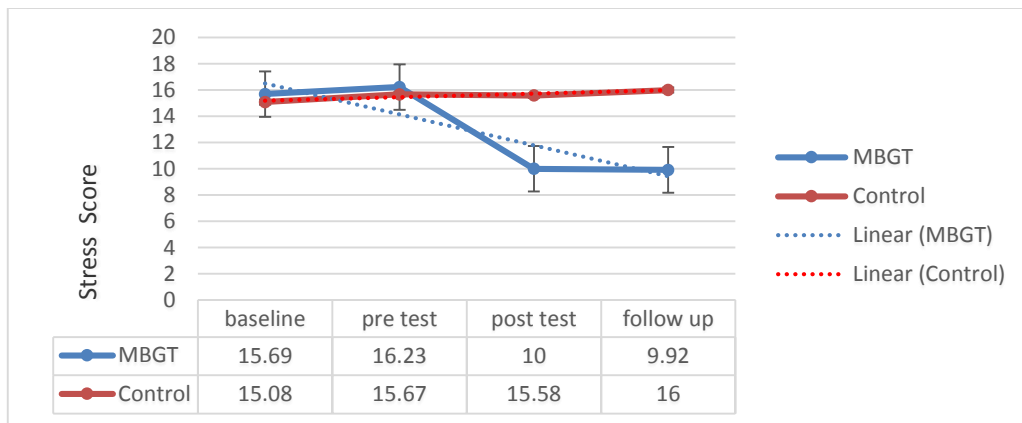
The intervention was established by Gina Biegel which has been coined as Mindfulness-Based Stretch Diminishment for Adolescents (MBSR-T). Biegel developed the MBSR program in 1994 for young people, which included mindfulness practices such as body check meditation, sitting reflection, yoga, and strolling reflection. The mindfulness intervention involved a 12 training program that was given to 12 hard of hearing adolescent girls. It consisted of weekly sessions that lasted approximately 1.5 hours. The main elements of the program included: 1)

Simple physical and mental exercises to increase mindfulness of what one experiences in the present moment, 2) Short teachings on mindfulness, stress management, and mindful communication supported by a course manual and CDs with mindfulness exercises for home practice, 3) A group process reflecting on ones experiences while practicing mindfulness at home and in the sessions. About half of the time in the sessions was devoted to this. After one preparation session, the mindfulness intervention was implemented in three phases: I) weeks 1–3: familiarization session and giving information about stress and a brief description of the eight sessions to follow. Raisin-eating meditation and then practicing the body scan, 30 minutes of meditation and then discussing feelings that arose out of the meditation, II) weeks 4–7: stress management training, purely four-dimensional viable anomaly mediation, learning to be aware of instant consciousness, analysis of the events of life and, III) weeks 8–12: the three-minute breathing space practice, practicing growth mindset, performing meditation exercises. For adolescents aged between eight and 12, training them in mindfulness required two therapists due to the frequency of physical exercises and the diversity of executive guidelines, and the direct need for training by the therapist. Therapeutic sessions were held in the presence of the researcher and

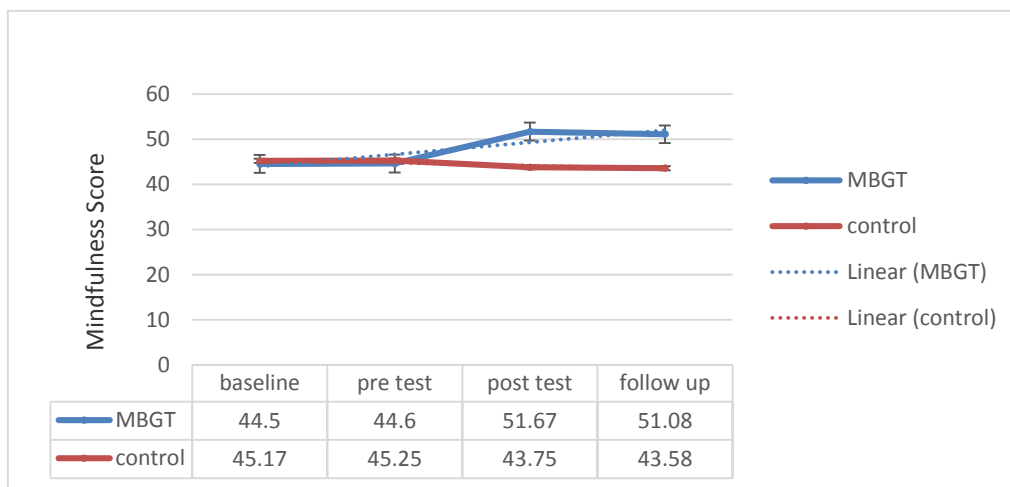
was accompanied by a PhD student in psychology, trained in mindfulness exercises. Mean, Standard Deviation, independent t-test, and repeated-measure, analysis of Variance (ANOVA) were used to analyze the data in both groups using SPSS-24. All data were checked for normality distribution, using the Shapiro–Wilk test. For small sample sizes, the Shapiro–Wilk test is usually used for detecting normality. The stress scores appeared to be normally distributed for the control group, [W (12) = 0.948, p =0.615], as well as for the intervention group, [W (12) = 0.868, p =0.062]. Furthermore, mindfulness scores appeared to be normally distributed for the control group, [W (12) = 0.884, p =0.10], and for the intervention group, [W (12) = 0.96, p =0.779]. The outliers were checked through z-scores and box plot. A visual check demonstrated that the data were normally distributed.

**Results**

Participants included 24 individuals who were assigned to the control group (n=12) or the intervention group (n=12). The independent t-test was performed to evaluate perceived stress between the control group and the intervention group, before Mindfulness-Based Group Therapy (MBGT). No significant differences were found in perceived stress between the intervention group and the control group.



**Figure 1.** Means of the stress for MBGT and control groups at four assessment times



Group means of the stress and mindfulness for MBGT and control groups at four assessment times were compared by independent t-tests. Note: for comparison of MBGT and control groups by independent t-test, the significant level was considered as  $^{**} < .01$ .

**Figure 2.** Means of the mindfulness for MBGT and control groups at four assessment times

Repeated measures of ANOVA analysis was conducted to test the differences between the intervention group and the control group, on stress and mindfulness. Group (MBGT vs. control) as between-subject and assessment time (baseline, pre-test, post-test, follow-up) as within-subject were tested. Similarities were found between the two groups at baseline and pre-test (Table 2 and Figures 1 and 2). A significant between-subject by within-subject interaction effect (TIME\*GROUP) was

found. Consequently, a within-subject effect (TIME) repeated measure ANOVA was run in both MBGT and control groups, with post-hoc pairwise comparisons of baseline, pre-test, post-test, and follow-up scores (Table 2). The independent *t*-tests were conducted for baseline, post-intervention, and follow-up comparisons, between MBGT and control groups to assess group differences in, stress and mindfulness before and after MBGT intervention.

**Table 2. Descriptive Statistics for the Control and Intervention Groups**

		Group	baseline	pre-test	post-test	follow-up
Stress	Control	M	15.08	15.67	15.58	16.00
		SD	2.610	2.348	1.881	2.045
	Intervention	M	15.69	16.23	10.00	9.92
		SD	3.202	2.941	2.374	3.059
Mindfulness	Control	M	45.17	45.25	43.75	43.58
		SD	7.259	7.250	5.987	5.744
	Intervention	M	44.50	44.58	51.67	51.08
		SD	7.317	7.077	6.719	6.762

**Table 3. Linear ANOVA Repeated Measure for Stress and Mindfulness Following the MBGT Intervention**

		TIME	TIME*GROUP	within-subject <sup>†</sup>	Post Hoc <sup>††</sup>	
Stress	Intervention	F(3, 66)= 23.05, <i>p</i> = .001, $\eta^2$ = .51	F(3, 66)= 29.87, <i>p</i> = .001, $\eta^2$ =.57	F(3, 33)= 35.83, <i>p</i> =.001, $\eta^2$ = .76	BS=PR BS > PO** BS > FO**	PR > PO** PR > FO** PO = FO
		Control			F(3, 33)= 1.15, <i>p</i> = .34, $\eta^2$ = .095	BS=PR BS = PO BS = FO
Mindfulness	Intervention		F(3, 66)= 12.48, <i>p</i> =.001, $\eta^2$ =.36	F(3, 44)= 30.99, <i>p</i> =.001, $\eta^2$ =.59	F(3, 33)= 40.81, <i>p</i> = .001, $\eta^2$ = .79	BS=PR BS < PO** BS < FO**
		Control			F(3, 33)= 2.14, <i>p</i> = .11, $\eta^2$ = .16	BS=PR BS = PO BS = FO

Note: BS= baseline; PR= pre-test; PO= post-test; FO= follow-up; Intervention (n=12); Control (n=12), \*\* < .01.

<sup>†</sup> = following the significant interaction effect (TIME\*GROUP), within-subject ANOVA reappeared measure as the simple effect, separately was done in both groups.

<sup>††</sup>= pairwise comparison for three assessment times, Bonferroni was used as the post-hoc test; significant pairwise showed by ">" and non-significant ones by "=".

Following the significant interaction effect (TIME\*GROUP), the results of the within-subject effect (TIME) in ANOVA repeated measures confirmed that the decreasing trend from time-1 to time-4 assessment point in stress was [*F*(3, 33) = 35.83, *p* = .001, partial  $\eta^2$  = .76] and [*F*(3, 33) = 1.15, *p* = .34, partial  $\eta^2$  = .095] for the MBGT and control groups, respectively. The independent *t*-test for comparison of MBGT and control groups demonstrated that, at baseline [*t*(22)=0.51, *p* = .62 (two-tailed), Cohen's *d* = .20], pre-intervention [*t*(22) = 0.53, *p* = .60 (two-tailed), Cohen's *d* = 0.21], post-intervention [*t*(22) = -6.38, *p* = .001 (two-tailed), Cohen's *d* = 2.60], and follow-up [*t*(22) = -5.72, *p* = .001 (two-tailed) Cohen's *d* = 2.34], yielded a significant reduction in stress in the MBGT group with a large effect size (Figure 2).

Following the significant interaction effect (TIME\*GROUP), the results of the within-subject effect (TIME) in ANOVA repeated measures confirmed that the increasing trend from time-1 to time-4 assessment point in mindfulness was [*F*(3, 33) = 40.81, *p* = .001, partial  $\eta^2$  = .79] control [*F*(3, 33) = 2.14, *p* = .11, partial  $\eta^2$  = .16] for the MBGT and

control groups, respectively. The independent *t*-test for comparing the MBGT and control groups demonstrated that, at baseline [*t*(22) = -0.22, *p* = .82 (two-tailed), Cohen's *d* = .09], pre-intervention [*t*(22) = -0.23, *p* = .83 (two-tailed), Cohen's *d* = .094], post-intervention [*t*(22) = 3.05, *p* = .001 (two-tailed), Cohen's *d* = 1.25], and follow-up [*t*(22) = 2.93, *p* = .008 (two-tailed) Cohen's *d* = 1.19], yielded a significant increase in mindfulness in the MBGT group with a large effect size (Table 3).

### Discussion

Based on the results of the present study, it seems that mindfulness is an appropriate and effective strategy in reducing stress among hard of hearing adolescent girls. The results of this study are in agreement with those reported in previous studies [29–31].

In a review study which had aimed at investigating the effectiveness of mindfulness-based stress reduction, Prassman [32] showed that these programs reduced stress and anxiety in different populations. The results of the study by Klatt et al. [33], demonstrated the effects of

mindfulness on the reduction of stress based on mindfulness in adults, which suggested that training significantly reduced perceived stress and increased self-awareness. Crane et al. [34] reported in a review study that mindfulness approaches can prevent depression and reduce stress among school teachers. Morvaridi et al. [35] showed that training in reducing mental health-related stress in patients with social anxiety disorder reduces emotional response and emotional regulation. These changes lead to a reduction in social avoidance behaviors, clinical symptoms, and systematic responses to negative beliefs in patients. Tanay et al. [36] in their study on mindfulness training reported that mindfulness skills reduced the symptoms of vulnerable people and stress significantly, from both the statistical and clinical point of view.

The results of the current study can be explained through the transition process that adolescents experience, as they are exposed to various changes including physical and sexual development, extreme emotions, identity seeking, and fear of responsibility, apprehension of university entry or job selection, and other challenging issues, which in turn can put a lot of stress on the individuals. Therefore, mindfulness training could potentially help adolescents in increasing their self-awareness as well as their experiential, non-judgmental, tolerant, trustworthy, patient, and kind relationships with others, which would subsequently affect interpersonal behaviors [37].

In other words, mindfulness training increases the awareness of relationships, which in turn reduces stress. Furthermore, in this intervention, the usual sources of stress in this age group and the appropriate response to stress were addressed, which would help ease the usual stressful situations and, in some cases, the elimination of these sources. Mindful breathing also leads to a reduction in the negative effects of stress. Preparing a list of thoughts and unreasonable demands will also help to increase an individual's knowledge of stress-creating thoughts. Understanding these irrational thoughts and challenging them leads to a more logical and realistic investigation of these thoughts, which themselves reduces stress [38].

Since the selection criteria for this study included certain inclusion criteria such as age range, level of education, and gender, the results could only be generalized within the desired range, and due to lack of time; it was not possible to compare the effectiveness of the treatment with other groups. Therefore, it is suggested that the effectiveness of this treatment be investigated further in different groups because there is a paucity of literature in this field. Conversely, for generalizations based on gender, it is suggested that the effectiveness of this method be evaluated on the male gender. It is also suggested that research be conducted in a longitudinal design to allow researchers to determine the effectiveness of these results over a long period.

## Conclusion

In conclusion, the results of this study showed that mindfulness cognitive rehabilitation training effectively reduced stress in hard of hearing adolescent girls.

Therefore, considering the positive effect of mindfulness on variables such as stress, academic institutions, and counseling centers are more likely to be involved in the implementation of this therapy in the future, and courses can be provided by an intervention model in educational settings.

## Conflict of Interest

The authors declare that they have no competing interests.

## Ethical Approval

All the research procedures involving humans were consistent with the National Research Committee's ethical standards, the Helsinki Declaration of 1964, subsequent revisions, or equivalent ethical norms. All participants in the study got informed consent.

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