



Effectiveness of Mindfulness-Based Stress Management in The Mental Health of Iranian University Students: A Comparison of Blended Therapy, Face-to-Face Sessions, and mHealth App (*Aramgar*)

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Abstract

Background: Stress is an important part of a college student's life. Psycho-technology has greatly helped students cope more effectively with stress.

Objectives: The aim of the present study was to compare the effectiveness of three methods of intervention for stress management in students based on mindfulness-based stress reduction, including blended therapy, smartphone mobile application, and face-to-face therapy.

Methods: A quasi-experimental study was designed with pretests, posttests, and follow-ups for a month on randomly selected students. The first group was treated by the *Aramgar* application only, the second group by both the face-to-face therapy and *Aramgar* application, and the third group by the face-to-face therapy only. The DASS-21 was utilized for both pretest and posttest administration. The ANOVA and post hoc tests were applied to analyze the data.

Results: The mean age of the participants was 24.29 ± 3.21 years. There was a significant difference in the mean score reduction of depression, stress, and anxiety between the three groups ($P < 0.001$). The post hoc test showed that the blended therapy group had the greatest mean score reduction on stress, depression, and anxiety among the three groups.

Conclusions: The blended approach could improve the mental health of students more than the two other approaches. Therefore, the use of mobile platforms of new technologies is highly suggested along with face-to-face interventions in clinics to support people within their daily routine.

Keywords: Stress Management, Mindfulness, Blended Therapy

1. Background

Due to their age, university students experience the highest levels of stress and anxiety (1-4). Most students, however, show low degrees of self-help and do not tend to call on psychological counseling centers (5). Research indicates the fear of being labeled as one of the major obstacles to attending counseling centers among students (6). Nonetheless, modern technologies have removed this obstacle so that recent studies demonstrated that students tended to use the internet to fulfill their health-oriented objectives and the gained information could influence their health-oriented self-care (7).

Today, many technologies have somewhat become a means to totally obliterate traditional mental health services (8). Thus, they are smartphones that have come to be

used in order to provide such services (9).

Mobile Health Care is a health-oriented application installed on smartphones and used through them (10). The use of such applications could be of importance since they lead to the patients' engagement in the treatment process. These applications are programs that are designed for various devices such as tablets, smartphones, etc. (11). The advantages of such applications include their possibility of use as complementary tools in psycho-education interventions, enhancement of the therapist-patient relationship, self-control, and patient empowerment (12). Research shows that the features of smartphone applications such as short messaging services (SMS) and notifications, particularly aimed at psycho-education, are effective in physical and psychological health. Therefore, such applications

and features like SMS could be among the most important tools to provide mobile intervention for mental health reasons (13). Applications designed for smartphones offer therapists the chance to provide their clients with reminders by the help of SMS and encourage them to do their duties more responsibly. As such, restrictions in access to patients are eliminated (14).

Several studies have suggested that the use of smartphone applications to provide mental health services has obviously affect providing services for a broad range of problems such as stress and anxiety (15), depression (16), bipolar disorder (17), and psychotic disorders. The results of these studies have shown that most cases with psychotic disorder (18) tended to use mobile applications to control their mental health (19).

Regarding stress, there have been some applications designed to manage stress and make the right interventions. In a systematic review, Coulon et al. (20) studied the effectiveness of applications used on smartphones in stress management. They found out that such programs have a potential capacity to put forward various strategies to manage stress. Most of the applications employed strategies for stress management based on such evidence as diaphragmatic respiration, meditation, mindfulness, cognitive reconstruction, search for social support, illustration, evaluation and assessment, and self-control.

A review of apps conducted by Mani et al. (21) in 23 different applications with regard to mindfulness in iOS platform showed that applications focused on teaching diaphragmatic respiration, body scan, sitting meditation, walking meditation, loving-kindness meditation, and three-minute breathing. The results of this study pointed out that the above-mentioned applications were effective in stress reduction. Christmann et al. (22) evaluated 62 smartphone stress management applications based on emotion-focused coping and the technique of behavioral changes. The most predominant strategies of these applications included biofeedback, deep breathing, nutritional points, imagination, meditation, mindfulness, muscle relaxation, body relaxation technique, and sports. About 48% of the applications were based on mindfulness and meditation, with proved effectiveness in stress management.

Apart from online interventions and those grounded on new technologies, for instance smartphone applications, a novel blended therapy has been developed in this field. This type of intervention seeks to integrate face-to-face therapy or traditional therapy with the modern electronic interventions (23). Blended therapies are to use the advantages of face-to-face sessions with internet and mobile-based interventions (24). Several studies have so far demonstrated better effectiveness of blended therapy than that of other methods (25, 26). Schuster et al. (27)

proved the effectiveness of this kind of therapy in stress reduction. Ly et al. (28) in their study applied interventions by smartphones as supplementary tools in face-to-face therapies to treat stress. In a systematic review conducted by Firth et al. (29) on psychological interventions for reducing anxiety by the help of smartphone support programs, it was found that such programs are highly effective. Morrison et al. (30) compared the effectiveness of smartphone applications with the use of websites. They concluded that the stress management applications on cell phones are more available than websites and people need to spend less time to access such applications. Hence, recent research in the field of psychological interventions has mainly concentrated on the use of web, mobile, or technology-based applications within the area of blended therapy. Studies showed that digital psychological interventions are under development and testing in Australia, Canada, the United States, and some European countries (31). As far as we know, there are no studies in relation to acceptability and effects of blended interventions on stress management in the Iranian culture.

2. Objectives

Due to the high levels of stress among Iranian university students (32, 33), the researchers of the present study attempted to make interventions to empower students for stress management and improve their mental health (respecting stress, depression, and anxiety) through different methods.

Another goal of this study was to compare the three methods of stress management, including blended intervention (face-to-face therapy along with the use of smartphone applications), interventions solely based on mobile applications, and interventions by face-to-face therapy via the educational - psychological approach particularly for students, and investigate the effectiveness of each method in mental health improvement.

3. Materials and Methods

3.1. Design

A comparison was made between the three stress management methods including blended intervention (face-to-face sessions along with the use of smartphone applications), intervention solely based on the application, and intervention by face-to-face sessions via the educational-psychological approach using a quasi-experimental design together with consistent pretests and posttest.

In the present study, we applied the *Aramgar* stress management application, designed for Persian-speaking

users. The stress management application *Aramgar* was designed based on emotion-focused coping according to the mindfulness-based stress reduction (MSBR). After installing and running *Aramgar*, users were asked to provide some information within the sign-up process.

First, users needed to provide their personal information such as the national ID number, sex, and age for the application to sign up. Second, during the sign-up and consent-gaining procedure, *Aramgar* administered the initial surveys that could be completed in multiple sittings requiring the user to spend 5 - 10 minutes on average to complete them. After completing the survey, a username and a password were activated. Finally, the suitable time to send messages and notifications were asked from users, which ranged from 9 to 11 in the morning, 13 to 16 in the afternoon, 17 to 19 in the evening, and 21 to 23 at night. After registration, a short video clip was displayed on *Aramgar* to introduce the stress reduction content adopted from the MSBR and the way the application was accessible.

In the first stage and layer of the application, in order to inform users, the primary training was performed in the course of a written text process. In this context, various contents were presented concerning stress, the process of stress formation, sources of stress, the physiology of stress comprising the automatic nervous systems, hormones and immune system, stress and illnesses, symptoms of stress, i.e. physical and psychological ones, stress management methods such as adaptation, controlling and stopping thoughts, modification of type A personality, time management, reading skills, preparation for exams, interpersonal relationships, nutrition, and sports.

In this section, numerous questionnaires were administered to measure self-assessment, such as the perceived stress scale (PSS-14), Weekly Stress Inventory, the Holmes and Rahe stress scale, physiological measures of stress, student stress survey (SSS), the occupational stress scale, and stress coping strategies questionnaire so that the users could measure themselves according to their needs for self-assessment and self-measurement. It should be noted that in the end, the feedback of the assessment regarding the level of stress perception was provided to users.

In the second stage and layer of application, *Aramgar* offered notifications to deliver a short set of questions to the users on a daily basis to assess their stress levels in actual time so that they could self-monitor their behaviors. The calculation of perceived stress scores was through asking three questions on stressful events and worry episodes (34). Participants were asked to indicate the duration of their worries: "less than 5 minutes, 5 - 30 minutes, 30 - 60 minutes, and more than 60 minutes." Afterward, they were asked to give the extent of the worry episode(s) on a scale ranging from "slightly intense" to "very intense" and "end

points ranging from 0 to 10" (10 positive and negative affect schedule (PANAS-SF) (35) ranging from "slightly positive or negative" to "extremely positive or negative", and the visual analogue scale (VAS) (36), which consisted of a small, unmarked 100 mm ruler with endpoints labeled as "none" and "as bad as it could be"). Participants should say how they felt stressed on the small ruler. The daily stress perception of the users was calculated using the sum of the scores of worry episodes scale, positive and negative affect schedule, and visual analogue scale. In the third stage and layer, based on the protocols of reducing stress of emergency response, the intervening notifications were delivered daily for 20 days in the form of audio, video, and text contents with approximately 40 characters according to the users' stress level (severe, moderate, or low).

The messages appeared in different formats. Some of them were in the form of educational videos of muscle relaxation such as tensing and relaxation of muscle groups, e.g., the muscles of legs, abdomen, chest, arms, and face, besides taking deep breath. The audio formats were on mindfulness skills such as mindfulness in daily living, three-minute mindful practice, mindful eating, managing thoughts, mindful breathing, body scan, walking meditation, mindful movement, mindfulness and values, kindness practice, and maintaining a regular practice. The other part of audio messages was related to single, specific sounds, e.g., the sound of nature such as waterfalls, river flow, and the wind and bird songs.

After diagnosing a severe level of stress in the users, an educational video on muscle relaxation and deep breathing was delivered to them to exercise and then, some text messages concerning mindful practices were given to them. In the end, some relaxing audio messages with natural sounds were played. Therefore, a specific timetable was designed for sending messages based on the users' stress level with contents prepared and developed under the supervision of a psychology specialist. Finally, the timetable was transferred to the programmers and developers of the application to regulate sending messages.

To put into use the results of the present study, following an introduction and explanation of the goals to the authorities of a counseling center at Tehran University of Medical Sciences and in collaboration with them, a workshop on stress management skills was announced for students who needed such skills or were conscious of their stress. The criteria for the inclusion of students in the workshop were as follows: studying or passing the last year, being evaluated and clarified in the last month for stress level through PSS-14, having no signs of psychiatric disorders (no referral to psychiatric centers in the last month), having experienced no psychological interventions in the last month; having a smartphone with An-

droid platform, and being interested in participation.

Therefore, a group of 68 students was formed. Then, during a meeting, the objectives of the study were explained to them and their consent for cooperation with the workshop was obtained. Afterwards, they were randomly assigned into three groups: *Aramgar* mobile application alone (Group 1, N=20), blended intervention, i.e., a combination of face-to-face sessions and smartphone application *Aramgar* for providing automated reminders and motivational messages based on the stress level of participants (Group 2, N=28) and, face-to-face sessions (Group 3, N=20).

All the three groups took the DASS-21 test. Following a meeting with the students of Group 1 and introduction of the study and its goals to them, they were asked to install the *Aramgar* application on their phones and do the exercises according to the notifications for 20 days. For Group 2, subsequent to the introduction of the study and its objectives, the students were asked to participate in face-to-face sessions and use the *Aramgar* application. Interventions in this group were made in six weeks during which, the students were invited to participate in the workshop sessions on Sundays and Tuesdays every week. The content of the workshop was based on the mindfulness-based stress reduction (MBSR) program developed by Dr. Jon Kabat-Zinn (37). It is used to increase skills such as body scan, sitting meditation, movement exercises, and mindfulness practice in daily life. At the end of the second session, the project director introduced the *Aramgar* application to the applicants and asked them to install it on their phones and do the exercises for 20 days in accordance with the notifications given. Finally, for Group 3, the stress management sessions were held at the counseling center on Mondays and Wednesdays every week for six weeks.

3.2. Ethical Considerations

This study was approved by the Ethics Committee of the Psychology Department of Shahid Beheshti University and Iran National Science Foundation (INSF). The project was approved under the reference number 94026766 on 2016-11-20. All participants provided written informed consent for participation.

3.3. Measures

Depression, anxiety, and stress scale (DASS-21) (33): The Persian version of the DASS-21 for depression, stress, and anxiety was used to assess the mental health of the students (38). Participants showed the extent to which they felt negative affect over the past week. This 21-item scale was scored on a 4-point Likert scale ranging from 0 (did not apply to me at all) to 3 (applied to me very much, or most of

the time). In this study, the subscales had good internal reliability for Iranian students (ranging from 0.81 to 0.97 for the depression, anxiety, and stress subscales).

3.4. Statistical Analysis

We used descriptive statistics, one-way ANOVA, and post hoc test (Bonferroni-corrected) for data analysis using SPSS version 23 (SPSS Inc., Chicago, IL). The level of significance was set at 0.05 for all tests.

4. Results

The participants' mean age was 24.29 ± 3.21 years. In terms of demographics, 71% of them were female, 47% were single, and 37% were married; 29% of the students were employed and the others were unemployed. The results of parallel investigations on the three groups proved no significant difference between the three groups in terms of age ($P > 0.05$). The demographic features of the participants are given in Table 1.

There was a significant difference in the mean reduction of depression score (posttest score minus pretest score) between Group 1, Group 2, and Group 3 ($F = 5.24, P < 0.001$). There was a significant difference in the mean reduction of anxiety score between Group 1, Group 2, and Group 3 ($F = 4.384, P < 0.001$). There was a significant difference in the mean reduction of stress score between Group 1, Group 2, and Group 3 ($F = 6.384, P < 0.001$). The Post hoc test showed that Group 2 had the greatest mean score reduction on stress, depression, and anxiety among the three groups. The scores are presented in Table 2.

5. Discussion

The aim of this study was to compare the three methods of intervention concerning their effects on the mental health and the levels of stress, anxiety, and depression of Iranian university students. The intervention methods included the intervention by blended therapy (the *Aramgar* cell phone application along with face-to-face sessions), intervention solely by the *Aramgar* application, and intervention only through face-to-face sessions. The interventions in the present study were designed via the psycho-educational method and in accordance with the mindfulness-based stress reduction (MBSR). In general, the results suggested that intervention through the blended therapy was more influential than the two other methods on mental health improvement and stress, depression, and anxiety reduction among the sample of Iranian students. The blended therapy included the participation of students in face-to-face sessions along with the use of the

Table 1. Demographics of the Study Population^a

Characteristics	Total	Aramgar Mobile Application (Group 1)	Blended Intervention (Group 2)	Face-to-Face Sessions (Group 3)
Age	24.29 ± 3.21	24.61 ± 3.23	24.23 ± 3.01	24.53 ± 3.00
Gender				
Female	48 (71)	18	10	12
Male	20 (29)	10	10	8
Marital status				
Single	32 (47)	15	8	13
Married	25 (37)	10	8	3
Widowed/ divorced/ separated	11 (16)	3	4	4
Job status				
Currently employed	20 (29)	10	4	5
Never been employed	48 (71)	18	16	15

^aValues are expressed as mean ± SD or No. (%).

Table 2. Pretest and Posttest Scores on Depression, Anxiety, and Stress for the Study Participants (N = 68)^a

Variables, Groups	Pretest	Posttest	F	P Value
Depression			5.24	< 0.001
Aramgar mobile application (Group 1)	15.21 ± 6.21	12.22 ± 5.34		
Blended intervention (Group 2)	15.68 ± 5.34	8.11 ± 4.96		
Face-to-face sessions (Group 3)	16.11 ± 5.56	9.45 ± 5.67		
Anxiety			4.384	< 0.001
Aramgar mobile application (Group 1)	13.54 ± 5.01	11.23 ± 4.34		
Blended intervention (Group 2)	14.67 ± 4.53	8.34 ± 5.45		
Face-to-face sessions (Group 3)	13.45 ± 5.04	10.61 ± 4.73		
Stress			6.384	< 0.001
Aramgar mobile application (Group 1)	14.34 ± 5.45	11.43 ± 4.57		
Blended intervention (Group 2)	15.76 ± 6.67	9.76 ± 5.45		
Face-to-face sessions (Group 3)	15.54 ± 5.34	10.34 ± 4.34		

^aValues are expressed as mean ± SD.

Aramgar application for sending daily notifications to the participants. The results of the present study was parallel to the findings of a study by Montero-Marin et al. (39) that used the blended web-based therapy (within four sessions and six-hour online support) through mindfulness approach and succeeded in increasing well-being and positive emotions among Spanish medical students. Moreover, Lauricella (40) applied the blended therapy to teach mindfulness to Canadian students and pointed out that the application of face-to-face sessions alongside the use of multi-media could strengthen the effects of mindfulness teachings. Hence, various studies have proven the effectiveness of the blended therapy in addressing mental dis-

orders. Evidence also suggests that the blended method is more cost-effective for health care settings than other methods (41). Considering the fact that the blended intervention provides the patients with the chance to deal with their problem and their mental health privately and individually, their personal priorities and needs would be better met and their self-management could be raised; in fact, this method brings treatment into daily and private lives of the patients (42). In the present study, since the participants attended face-to-face sessions to obtain guidance at the same time as they made use of the *Aramgar* smartphone application, it could be claimed that the guidance provided through a stress management approach based

on the MSBR could positively affect the students' mental health. Although the materials given to the participants in face-to-face sessions were similar, the notifications delivered daily in the forms of audio, video, and text contents were prepared according to the stress level perceived by each student. Thus, the course of support and individual intervention was shaped through each person's needs. Several studies have indicated that the use of mobile phone app interventions in psychological matters must be combined with the active engagement of clients in the whole process (43, 44). In consequence, one of the reasons for the effectiveness of the blended intervention in the present study was the further engagement of the participants with the contents sent to them by the *Aramgar* application on a daily basis, which was applied also parallel to the face-to-face sessions. Sandrick et al. (45) in their study on the effect of counseling sessions alongside text messaging on self-selected health behaviors of university students proved that such sessions together with the messages could lead to better health-oriented behaviors.

In terms of stress, the results of the present study demonstrated a significant difference in the mean reduction of stress score between Group 1, Group 2, and Group 3 ($F = 6.384, P < 0.001$). Concerning the variable of anxiety, there was a significant difference in the mean reduction of anxiety score between Group 1, Group 2, and Group 3 ($F = 4.384, P < 0.001$). The Post hoc test showed that Group 2 obtained the greatest mean score reduction on stress among the three groups ($P < 0.01$). The findings of the present investigation are similar to those of the study by Crandall et al. (46) that designed the BINGOCIZE application to use for stress reduction in university students. By providing exercises and health-oriented guidance, this application could considerably decrease the level of stress perceived by students and improve their stress management knowledge, leading to their better academic performance. Ly et al. (47) examined stress management improvement in Swiss middle managers via an acceptance and commitment-based smartphone application, showing that it could reduce stress and raise the general health of the participants. Overall, psychological treatments aided by smartphones can lead to a decrease in anxiety among users (15). The present study also emphasizes the effectiveness of blended interventions in stress management and mental health improvement of students. As a result, it is strongly suggested that the effectiveness of the blended interventions be evaluated in future research and its feasibility be investigated for various age groups of children, teenagers, and adults with the higher levels of perceived stress.

We also showed a significant difference in the mean reduction of depression score between Group 1, Group 2,

and Group 3 ($F = 5.24, P < 0.001$). The Post hoc test showed that Group 2 had the greatest mean score reduction on stress among the three groups ($P < 0.01$). In other words, the mean score of depression was significantly lower in the blended therapy group than in the other groups. The previous studies have pointed out that the patients' experience with group therapy sessions alongside the use of mental health mobile apps has been successful in depression improvement (48, 49). Furthermore, many studies have focused on the effect of smartphone applications on depression (50). Here, one of the most prominent examples is the Mood Hacker application. This application has been designed to teach users how to employ daily exercises in order to improve the signs of depression and enhance their resistance to the situation ahead (33). Therefore, alike Mood Hacker, the *Aramgar* application could diminish depression because of reducing negative thoughts, enhancing mindful behaviors, and focusing on the present moment. In addition, the effects of the *Aramgar* application have been similar to those of Intellicare, which is a skill-based application designed to lessen the signs of depression and anxiety in users (51). Intellicare has proven to be able to lower depression and anxiety in users by engaging them in treatment for a long time. Thus, it is highly suggested that smartphone applications be designed for Persian users via the CBT approach in the future studies and evaluate their effectiveness in terms of depression reduction.

Similar to other studies, the present study had a number of limitations. The first one was the relatively low number of study subjects, which calls for caution in any generalization of the results. The second restriction was the lack of total control over the research sample to prevent possible interference of irrelevant and uncontrollable variables with the independent ones. The third limitation was about the *Aramgar* application. In the employed version of the application, it was impossible to give users feedback and check if they were doing the exercises as instructed or not. Therefore, it is necessary to add this feature to the next versions of this application to further increase the effectiveness of its use.

In the end, respecting the new generation's interest in modern technologies, it is suggested that new electronic gadgets be used to improve the mental health. Due to the lack of smartphone applications for psychological purposes designed for Persian-speaking users, researchers and experts in the area of mental health must design and produce such applications through CBT and ACT approaches to be applied for stress management along with the traditional therapies; then they can investigate the effectiveness of such applications in RCT studies. Therefore, it is highly suggested that in order to empower students for

self-care skills, applications such as *Aramgar* be developed and used in counseling centers along with psychological services provided through traditional face-to-face sessions under the name of E-Mental Health.

5.1. Conclusions

Concerning the widespread use of information and communication technology devices such as smartphones among people in today's societies and the high popularity of the internet among Iranians, it is necessary to use such technologies and capabilities in the service of higher goals such as enhancement of mental health and provision of mental health services. Due to the increasing trend of stress-causing factors, there is a greater need than the past for means of supporting people in their daily life far from therapy centers. Thus, the present study was conducted to prove the effect of the blended interventions on the Iranian students' mental health. As a result, along with the interventions made by mental health therapists at counseling centers, new technological platforms must be employed to help and support patients in their daily life.

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Footnotes

Authors' Contribution: Somaieh Borjalilu was the main researcher and wrote the first draft of the manuscript. Mohammad Ali Mazaheri and Alireza Talebpour supervised the study and revised the manuscript critically for important intellectual content. Somaieh Borjalilu collected the clinical data, conducted the statistical analysis, and interpreted the data. All authors read and approved the final manuscript.

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Ethical Approval: This study was approved by the Ethics Committee of Department of Psychology of Shahid Beheshti University and Iran National Science Foundation (INSF). Reference number of approved study proposal is 94026766 on 2016-11-20. All participants provided written informed consent for participation.

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