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Original Article

The effectiveness of cognitive-behavioral intervention based on stress-induced immunization training on improving sleep quality and mental health of adults during covid-19 pandemic

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Abstract

Following the prevalence of the Covid-19 pandemic, people especially the elderly over the age of 65 are more vulnerable to the disease. The purpose of this study was to investigate the effectiveness of cognitive-behavioral intervention based on stress-induced immunization training in order to improve sleep quality and mental health of the older adults during pandemic lockdown. This was a quasi-experimental study with pre-test and a control group. The participants were 21 older adults with poor quality of sleep in Tehran, Iran during 2021-2022. This online study was carried out in the last week of July 2021. Snowball sampling was used to recruit the participants from one source to another. In order to develop an e-questionnaire, Whatsapp link was used, which contained close-ended items as well as Likert-scale questions on Sleep Quality Index (PSQI) and General Health Questionnaire (GHQ-12). The individuals were randomly divided into experimental (n=12) and control groups (n=9). The experimental group was trained weekly on immunization against stress based on cognitive-behavioral principles (10 weekly sessions, 45 minutes), while the control group did not receive this training. After collecting data, SPSS V. 23 was used to analyze the data ($p > .05$). Demographic findings showed that the number of women was more than men (24.63% men and 75.37% women) and the Mean ± SD age in the experimental group was 64.52 ± 14.83 and in the control group it was 62.54 ± 13.55, which did not differ significantly in terms of this variable ($p > .05$). The results showed that cognitive-behavioral intervention based on stress-induced immunization training significantly improved sleep quality and mental health in the experimental group ($p < .001$). Overall, the stress immunization program is an effective way to improve sleep quality and the mental health of older adults during the pandemic lockdown. Therefore, it is recommended to focus on such intervention to help vulnerable groups during this pandemic.

Keywords

Stress-induced immunization training, sleep quality, mental health, older adults, pandemic lockdown.

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Introduction

After the exponential growth in infections and first Covid-19 deaths worldwide, the World Health Organization (WHO) declared the pandemic as a Public Health emergency on the 11th of March, 2020. At its peak, 2.5 million people have died and more than of 110 million cases were confirmed. Based on the epidemiological record in September 2021, coronavirus cases and deaths globally continued with 219 million cases and 4.55 million deaths. Regarding coronavirus vaccination, more than 5760 million doses have been administered worldwide, and 30% of the world population including 2370 million citizens have been immunized (Clemente-Suárez et al, 2021; Partinen et al, 2021). Historically, many civilizations have been plagued by infectious diseases which have highly affected our history as well. Quarantine and vaccination are two of the oldest, most effective preventative measures. Isolation

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prevents the disease from spreading between sick and healthy people; quarantine is used to restrict the movements of suspected transmitters before the appearance of symptoms (Wilder-Smith and Freedman, 2020).

Basically, Isolation has been identified as a factor that has many psychological impacts on individuals during epidemics; however, its effects on sleep quality and mental health of older adults have not been studied sufficiently. Under the effect of isolation, sleep problems and psychological disturbance appear to have been recognized as important issues during the ongoing Covid-19 pandemic among the cohort of patients from China and Italy (Wang and Han, 2021). Lack of adequate sleep over time has detrimental effects on many biological processes which resulting in loss of wellbeing, possibly due to the changes in brain homeostasis (Nedergaard and Goldman,2020). Wang et al. (2020) examined the influence of frailty status and polypathology on psychological distress among 2195 Community-dwelling elderly participants who were aged 65 years or above living in rural parts of Shandong, China before and during the COVID-19 pandemic. Data of the study were collected through face-to-face interviews conducted from August to December 2014. Questions were asked about various aspects of lifestyle behavior, sleeping quality, and emotional distress (such as anxiety and depression). The findings of the study revealed that the sleep disorders were highly prevalent among the elderly in rural China. Moreover, the findings of another research revealed a significant decrease in good sleep quality, activity level, and wellbeing during the Covid-19 pandemic. The number of sample participants reporting good sleep decreased from 46 to 36% while the number of participants reporting poor sleep increased from 54 to 64% (De Pue et al, 2021).

Several months after the UK government announced lockdown measures, a general mood permeated the United Kingdom (UK) which affects sleep quality. Duffy (2021) conducted a survey which suggested that the COVID-19 pandemic may have a significant short and long term impact on sleep quality and anxiety levels in the UK. Based on the people reports, six out of ten respondents experiencing disturbed sleep, wakefulness, sleep disturbances of both short and long durations, and vivid dreams. Another survey on adults living through the COVID-19 was carried out in the UK. Totally 843 participants were included in the analysis. Findings of the study indicated that 69.4% reported sleep disturbances, less than half (44.7%) reported refreshing sleep, 45.6% were sleepier than before the lockdown, and also 65.2% reported mental health issues during the lockdown (Perez-Carbonell et al, 2020; O'Regan, Jackson, Young, Rosenzweig, 2021). Evaluation of peritraumatic distress during the COVID-19 pandemic displayed the highest distress index for people aged between 18-30 and over 60 which might have contributed to poor psychological conditions (Gorgoni et al, 2020; Tao et al, 2021).

Obviously, psychological suffering has been reported increasingly during the COVID-19 pandemic, and also lockdowns led to increase in suicide rates across the globe (Ahammed et al, 2021). In the literature review, most of the interventions were found to be beneficial to healthy living of older adults. Among several other interventions, a cognitive-behavioral intervention based on stress-induced immunization training is identified. Stress immunization training (SIT) is a combination of the best- Induced cognitive-behavioral elements. The basic principle of immunization training is related to the process of thinking, feeling, behavior, and the impact on others as the main proximity of behavior. In other words, SIT strongly and directly emphasizes the thoughts, emotions, understanding, and analysis of the daily life (Nequee, Oraki, Janbozorgi, Alipoor, 2021). Stress immunization training program reduces physical symptoms, anxiety, insomnia and depression, which means that this training improves mental health in individuals (Sohrabi et al, 2019).

Although some of the studies have indicated the effectiveness of cognitive-behavioral-based stress management training on reducing anxiety, depression, and stress (Hajilou, Ahadi, Seirafi, & Shahbeigi, 2021) several studies have indicated the opposite results. Based on these studies, the anxiety of people with physical disorders has not been reduced through the psychological immunization program. They explained that psychological immunization is a beneficial and practical strategy for various physical disorders, but has limitation on reducing anxiety and worries (Pahlavanneshan, Pourmohamadreza-Tajrishi, & Shokri, 2015). Contrarily, other research was concentrated on determining the effectiveness of an immunization program on the stress, anxiety and depression (Pahlavanneshan et al, 2015 Madison, Shrout, Renna, & Kiecolt-Glaser, 2021).

This approach can be effective in promoting psychological variables. Individual circumstances may vary as a function of age. There has not been enough focus on sleep quality and mental health during lockdowns in older adults. Furthermore, there are no published data (to our knowledge) about the impact of stress immunization training on sleep and mental health among at-risk groups within Iranian sample. This is surprising given the fact that sleep quality correlates with health, psychosocial and cognitive outcomes and may accelerate the development of chronic multi-morbidity in older adults (Neto, Tavares, Galvão-Coelho, Schuch, & Lima, 2020). Furthermore, shielding may engender greater social isolation. Hence, the current study aimed to investigate stress immunization training on the quality of sleep and the mental health in the Iranian older adults' population during the lockdown.

Method

Participants

This was a quasi-experimental study with pre-test and a control group. The statistical population consisted of 21 older adults with poor quality of sleep in Tehran in 2021-2022. This Virtual-based study was carried out in the last week of July 2021. Following WHO recommendation on social distancing, data were collected using a self-administered e-questionnaire in order to avoid face-to-face contact with the potential participants. Regarding sampling method, the participants were recruited of the online survey through snowball sampling from one source to another.

Instrument

Subjective sleep quality:

Sleep quality was assessed by the Pittsburg Sleep Quality Index (PSQI) (Buysse,1991). PSQI assesses the quality of sleep over a one-month time by taking a self-reporting questionnaire consisting of seven components and 24 questions. Each element is scored from '0' to '3'. Higher scores represent poor sleep quality while lower points denote a healthier sleep quality. The PSQI is based on a four-point scale, ranging from 'very good 0' to 'fairly good 1' to 'fairly bad 2' to 'very bad 3.' The respondents were categorized as either 'good' ('very good 'and 'fairly good') or 'bad' ('fairly bad 'and 'very bad'). The reliability of the test is 0.81 according to Cronbach's alpha. Confirmatory factor analysis indicators supported the "goodness of fit" of the structural equation model. In addition, the internal consistency of the PSQI is 0.81 and the scales' correlation score ranged from 0.48 to 0.71 (Chehri,2020).

General Health Questionnaire, GHQ-12:

Psychological distress was measured using the Iranian version of 12-item General Health Questionnaire (Goldberg & Williams, 1988). It is used to detect non-psychotic disorders such as depression and anxiety. The scale asks whether the respondent has experienced a particular symptom or behavior recently. Each item is rated on a four-point scale (less than usual, no more than usual, rather more than usual, or much more than usual). The GHQ-12 as a screening tool is a brief, simple, easy to complete, and its application in research settings is well documented. This questionnaire is translated and validated in Persian by Montazeri *et al*. in 2003. It has been found that the Iranian version of the GHQ-12 is reliable and validate, thus can be used for measuring psychological wellbeing in Iran (Cronbach's alpha coefficient = 0.87) (Goldberg & Williams, 1988). The original scoring method was used in the current study. In this method each response was assessed using a 4-point scale: 0, 0, 1, and 1 respectively. The scores ranged from 0 to 12. The higher values indicate more psychological symptoms (Montazeri et al., 2003).

Procedure

The participants were invited through their Messenger accounts and requested to share the link of the e-questionnaire with others in their social networks. The target population was the Iranian older adults aged between 60-75, having poor quality of sleep, and being satisfied to participate in the study. Exclusion criteria in the study included corona disease, the absence of more than two sessions of training, failure to participate in the continuation of research. In the pre-test, the study group used "what's up" link to develop an e-questionnaire which contains close-ended items as well as Likert-scale questions on Sleep Quality Index (PSQI) and General Health Questionnaire (GHQ-12). After receiving e-questionnaire, the selected individuals were randomly divided into experimental (n=12) and control groups (n=9). The experimental group was trained weekly on immunization against stress based on cognitive-behavioral principles (Meichenbaum, 2017) (Table1), while the control group did not receive any training. The number of weekly sessions was 10 sessions and the duration of each session was 45 minutes. Both groups were evaluated using a post-test to measure the impact of the independent variable on the dependent variable. After collecting data, SPSS V. 23 was used to analyze the collected data. In addition to descriptive statistics comprising mean and standard deviation, and empirical and statistical studies, we employed covariance analysis (MANCOVA) and variance uniformity Leven.

Table 1. Content and Treatment Sessions (Meichenbaum, 2017)

Session1	Describe the factors of causing stress, response to factors of causing stress, awareness of the physical effects of stress and its possible consequences on health-muscle relaxation for 16 groups of muscles
Session2	Stress and awareness (of automatic thoughts and physical sensations)—muscles relaxation for 8 muscles
Session3	Describe the relationship between thoughts and emotions-diaphragmatic breathing, muscle relaxation for 4 groups of muscles
Session4	Identification of negative thinking and cognitive distortions-breathing, illustration and passive muscle relaxation
Session5	Replacement of logical thoughts—Self-training when they experienced feelings of heaviness and warmth
Session6	Learn to deal effectively—Self-training for heart rate, respiration, abdomen and forehead
Session7	Implementation of effective coping response—Self-training with illustration and self-induction
Session8	Anger management training and mantra meditation
Session9	Gary expresses training—Counting breath meditation
Session10	Social Support—Overview of program and personal stress management program. The presentation of material in each session was first to review the material of the last meeting, the materials of that session were presented, and at the end of that session the new materials were reviewed and finally a new task has been given to them

Results

Demographic findings showed that the number of women was more than men (24.63% men and 75.37% women) and the Mean ± SD age in the experimental group was 64.52 ± 14.83 and in the control group was 62.54 ± 13.55, which did not differ significantly in terms of age variable (p > .05).

Table 2. Descriptive Indicators of research variables in experimental and control groups

Variables	Groups	Experimental	Control
		Mean ±SD	Mean ±SD
Sleep quality	Pre-test	18.13±1.50	16.53±2.89
	Post-test	14.53±1.89	16.90±2.39
Mental health	Pre-test	54.9±20.5	59.3±20.3
	Post-test	75.2±19.8	57.3±21.2

As part of the inferential statistical analysis, the normality of the variables in the study was evaluated using the Kolmogorov-Smirnov test. The significance levels of the Kolmogorov-Smirnov test for the research variables (quality of sleep and mental health) are higher than 0.05. As a result, the observed distribution is the same as the theoretical distribution, so we can conclude that the data are normally distributed. Therefore, considering that the distribution of scores of variables is normal, the parametric test is employed. MANCOVA has been used to evaluate the effectiveness of cognitive-behavioral immunization intervention against stress on the quality of sleep and mental health.

These tests showed no significant results for any of the variables, which allowed the normality assumption to remain intact. The homogeneity assumption in the variance-covariance matrix (test box) and group variances (Leven test) was also used before using MANCOVA. According to the results, there was a significant difference between the mean of the tests regarding the effectiveness of cognitive-behavioral immunization against stress on research variables (P = 0.001, F = 7.73 (10 and 73), Wilks' Lambda = 0.510).
The results of Table 3 showed that cognitive-behavioral intervention based on stress-induced immunization training significantly improved sleep quality and mental health in the experimental group (P- <0.001).

Table 3. Results of analysis of covariance under the components of sleep quality and mental health in experimental and control groups for interaction testing

Source of change	Variables	SS	Df	MS	F	P-value	Eta
Groups	Sleep quality	442.698	1	442.698	.852	.036	.010
	Mental health	1572.618	1	1572.618	1.799	.018	.021
Error	Sleep quality	9957.163	1	9957.163	19.160	.000	.189
	Mental health	12078.990	1	12078.990	13.818	.000	.144

Discussion

This study aimed at conducting an investigation into improvement of the sleep quality and mental health among the older adults during pandemic lockdown. Various groups of people have reported poor sleep quality, mostly in the COVID-19 epidemic (Duffy, 2020; Perez-Carbonell et al, 2020; O'Regan et al, 2021; Gorgoni et al, 2020; Tao et al, 2021). This study showed that cognitive-behavioral intervention based on stress-induced immunization training significantly improved sleep quality and mental health among older adult community residents in Iran during the COVID-19 pandemic. As previous studies have found, COVID-19 pandemic is associated with sleep disorders, sleep quality, and mental health (Basishvili, et al, 2022; Guan et al, 2020; Cau et al, 2021; Lithander et al, 2020). There is not any research which examines an intervention to compare the findings. Therefore, regarding stress this approach is extremely important.

COVID-19 is associated with increased severity, morbidity, and mortality in older adults (Cau et al, 2021; Lithander et al, 2020), nowadays, the age distribution of the world's population is shifting toward older ages, (Wang et al, 2020). Many studies represent the fact that older adults are more vulnerable to have COVID-19, but only a few online surveys have addressed how they coped with, endured, and dealt with lockdown during the crisis (World Health Organization,2020; López et al, 2020). In this study, researchers used the cognitive-behavioral intervention based on stress-induced immunization approach in order to improve the quality of sleep and mental health of the elderly. This approach has been implemented on the elderly for the first time, while before the Covid-19 crisis this approach has been used to improve occupational stress of midwives (García-Portilla et al, 2021) ineffective attitudes of patients with primary blood pressure (Navidian, Navaee, & Kaykha, 2019), coping with stress strategies, emotion Regulation strategies and mental health in female-headed households effectively (Sohrabi et al, 2019).

The goal of stress immunization is to inform the clients about the threat of stressful conditions. A major feature of this program that sets it apart from other stress control methods is its flexibility which makes it applicable to different groups in different periods (García-Portilla et al, 2021). Implementing patient's therapeutic approach encourages them to evaluate the accuracy of their thoughts as well as their own self-configurations through enabling them to be insolent to evaluate the credibility or correctness of their thoughts (Nequee et al, 2021; Meichenbaum, D. (2017).

The stress immunization program as a multidimensional approach can intervened thoughts, emotions and related behaviors. Moreover, the components such as cognitive reconstruction, tremendous exercises, and positive thinking methods have a significant effect on the exposing and adjusting the excitement and promoting healthy behavior (Meichenbaum, 2017; Narimisaei et al, 2021). According to the findings of this study Meichenbaum model-based immunization training help therapists to work on cognitive and behavioral skills. Among these strategies, cognitive reconstruction, changing negative self-belief, behavioral effort for relaxation, and self-confidence in dealing with stressful situations caused improvements on the sleep quality (Nequee et al, 2021).

Conclusion

Older adults with poor sleep quality and mental health problems may benefit from the targeted intervention. This is the first study designed to understand sleep quality and mental health during the lockdown among the Iranian population. Multidisciplinary actions are necessary to prevent the further spread of COVID-19 through designing appropriate response measures. The work provides further evidence of the adverse effects of social isolation during the COVID-19 pandemic on the sleep quality and offers recommendations for future studies including research into the contribution of the vulnerabilities to sleep disruption and COVID-19-related complications, identifying modifiable risk factors that may facilitate tailored interventions with the aim of promoting optimal sleep, and at last but not least providing empirical evidence to support health policy development. During the COVID-19 pandemic, this vulnerable group would benefit from immediate intervention. The respective healthcare authorities in Iranian should proactively intervene to address these factors to improve sleep quality and mental health of the elderly people. There is a need to address sleep quality and mental health through online counseling, awareness, and motivation.

Limitation

The present study has some shortcomings. It should be noted that regarding social distances and lockdown, this study as an online-based survey does not show an accurate representation of all Iranian older adults due to the fact that online-based studies might result in occurring of sampling biases and exclusively including those with internet access. As a result, it has a range of limitations (e.g., social desirability, memory recall, etc.), which cannot be avoided through face-to-face interventions. Despite the snowball sampling method used to recruit adequate sample, this study cannot be representative nationally.

Ethics Statement

The study protocol was reviewed and approved by the Islamic Azad University of Tehran.

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Disclosure Statement

The authors declare that there was no commercial or financial relationship that could be construed as a potential conflict of interest in their research.

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