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The Impact of Web-Based Mindfulness Yoga on Elderly Caregivers' Insomnia, Sleep Quality, and Beliefs in Ideal Care: A Repeated Measures Analyses

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Abstract

Aim: The purpose of the present study was to investigate the impact of web-based mindfulness yoga on elderly caregivers' level of insomnia, sleep quality, and beliefs in ideal care using a repeated measure analysis. Web-based interventions are highly beneficial for many individuals of all ages since they are accessible, convenient, private, cost-effective, and can impact on a large scale. Since there is no study examining the impact of web-based mindfulness yoga programs on insomnia, sleep quality, and beliefs in their ideal care, this study is worthy of investigation. **Methods:** A total of 27 care workers who met all criteria from care service centers for the elderly in the Kyushu area, Japan, completed the Insomnia Severity Index, Sleep Quality Scale extracted from the Oguri-Shirakawa-Azumi Sleep Inventory, and Caregivers' Belief in Ideal Care before and after practicing a web-based mindfulness yoga program. We employed a within-subject design to investigate the effect of mindfulness yoga on those measured surveys. **Results:** Repeated-measures ANOVAs were performed by comparing the ISI-J, CBIC, and Sleep Quality Scale before and after the intervention. The results revealed that participants significantly improved their insomnia, sleep quality, and beliefs in ideal care, which were assessed after the intervention compared to before the intervention. **Conclusion:** Web-based interventions are extremely beneficial for many individuals of all ages since they are accessible, convenient, private, cost-effective, and can impact on a large scale. Furthermore, given that alleviating poor work environment may be associated with mitigating high turnover rates and prevention of maltreatment

of their elderly clients, this study has added to current literature the crucial roles of web-based intervention programs. We hope that our findings will encourage the provision of web-based intervention programs where caregivers can practice them during their break or at home.

Keywords

Web-Based Mindfulness Yoga, Insomnia, Sleep Quality, Caregivers' Beliefs in Ideal Care

1. Introduction

The number of elderly people in Japan who require care has increased yearly. Furthermore, because long-term care insurance is now required for Japanese people aged 65 and older, it is predicted that the number of elderly people living in caregiving facilities will continue to increase every year [1]. Despite the tremendous need for licensed professional caregivers for this growing population, the Japanese government has projected a shortfall of 377,000 professional caregivers by 2025 [2].

It is also necessary to address the high turnover rate of professional caregivers in Japan, which exacerbates this shortage. One reason for the high turnover rate is the burden and stress experienced by staff working at elderly care facilities, which is widespread and severe [3]. Sleep deprivation/disturbance is also a common issue among caregivers because elderly individuals, particularly those with dementia, tend to engage in nocturnal behaviors. Researchers warn that the burden, stress, and sleep deprivation associated with caring for elderly people may be associated with maltreatment or abuse of elderly people [4]. Therefore, urgent action is essential to protect elderly individuals from inappropriate care.

Physical, emotional, or mental exhaustion in professional caregivers is associated with decreased motivation, reduced performance, and negative attitudes toward oneself and others [5]. To understand this interaction, Kukihara *et al.* [6] examined the effect of insomnia, which is likely to lead to physical, emotional, or mental exhaustion, on elder maltreatment and caregivers' beliefs in ideal care. They found that insomnia is related to a tendency toward elder maltreatment and decreased beliefs in ideal care and that psychological resilience is a significant mediator in the relationship between them. That is, when psychological resilience was statistically controlled, the relationship between insomnia and the tendency toward maltreatment and decreased beliefs in ideal care became insignificant. Furthermore, another study showed that participating in mindfulness yoga or other physical activities significantly improved psychological resilience [7]. Therefore, the authors of the study recommended physical activity to address burnout and insomnia as psychological resilience, which is a fluid personality characteristic and not a trait, can be improved.

In the present study, we focused on web-based mindfulness yoga to improve

psychological resilience, as mindfulness and yoga are as effective as moderate exercise for improving psychological resilience [7]. Previous studies have also shown that mindfulness yoga improves sleep quality [8] [9]. However, to date, there are no studies that investigate the effects of web-based mindfulness yoga on sleep quality.

Web-based intervention programs have several benefits. Extensive research has demonstrated that web-based interventions are beneficial for individuals of all ages because they are accessible, convenient, private, cost-effective, and can impact on a large scale [10] [11]. For instance, using systemic review and meta-analyses, Heber *et al.* found that web- and computer-based stress-management interventions can be effective and have the potential to significantly reduce stress-related mental health problems [11]. Numerous investigations have also highlighted the significant effects of web-based interventions aimed at improving physical activity [12]-[14]. Murray *et al.* found that web-based yoga and web-based physical exercise were equally effective in reducing symptoms of depression [15]. Moreover, mindfulness meditation, which was incorporated into the web-based mindlessness yoga intervention in the present study, had a significant impact on caregivers' personal feelings of achievement [7]. Similar to caregivers' belief in ideal care, which is our interest in the present study, personal achievement is related to having a greater understanding of how patients feel and being able to deal with patients' problems easily and effectively. It also creates greater work motivation and increases the feeling of responsibility to carry out work in a satisfactory manner [16]. Therefore, we hypothesized that web-based mindfulness yoga would significantly improve insomnia, sleep quality, and caregivers' belief in ideal care.

2. Materials and Method

2.1. Participants/Procedure

We recruited participants for the present study from older-adult care facilities in the Kyushu area in Japan. After receiving approval from the directors of the facilities, we sent consent forms to all licensed care workers with self-addressed stamped envelopes. The consent form explained the purpose/procedure of the study and outlined inclusion/exclusion criteria. To participate in the study, care providers had to 1) be between 20 and 65 years old, 2) work between 30 and 40 hours a week in their facilities, 3) have worked more than one year as caregivers for elderly patients, 4) have maintained a current licenses, 5) have access to the internet, and 6) commit to complete a four-week intervention. The criteria excluded care providers who 1) were receiving treatment for cardiovascular/respiratory diseases, 2) had musculoskeletal problems that could be exacerbated by exercise, 3) had gotten advice from a doctor not to exercise, and 4) were taking any medications that would alter sleep quality and quantity during the time of data collection.

Next, we sent the survey instruments to 27 caregivers of elderly patients who met all inclusion and exclusion criteria and consented to participate in the study. The directors of the facilities did not know who participated in the study. Participants' ages ranged from 23 to 63 (M = 42.59; SD = 11.43). Six of the participants were

men and 21 were women, 6 were single, 17 were married, and 4 were divorced or widowed. The sample size was small because we were exhausted to find willing participants who met all criteria.

The four-week intervention consisted of two stages: the first two-week period (Before Intervention stage) and the second two-week period (After Intervention stage). Before the first stage began, we met with participants online to restate the criteria, purpose, and process of our study. In the meeting, we asked participants to work as usual during the first stage of the study, which would start when they responded to the survey instruments that we sent to them via ground mail. The survey instruments included the demographic survey, the Insomnia Severity Index-Japanese version (ISI-J), the Caregivers' Belief in Ideal Care questionnaire, the Oguri-Shirakawa-Azumi (OSA) Sleep Inventory**,** daily diaries, and a self-addressed stamped envelope. Using the daily diaries, participants were instructed to checkmark the dates they practiced mindfulness yoga for 20 minutes and to record any significant incidents that may have occurred due to their practice. Participants were asked to keep the daily diaries for use during the After Intervention stage. They responded to the other survey instruments and returned them to us by ground mail.

After completing the Before Intervention stage, participants began the second stage, in which they were to practice web-based mindfulness yoga for 20 minutes each day for 2 weeks. We sent the link to the video via email the day before the intervention started. On the day the participants completed the second stage, we sent them the same survey instruments via ground mail and asked them to return them as soon as possible. The majority of participants returned the survey instruments within five days. According to the daily diaries, all participants engaged in the program each day for 2 weeks. We then compared the effects of participating in stage 1 and stage 2. This study took place between June 2023 and August 2023.

2.2. Materials

2.2.1. Web-Based Mindfulness Yoga Videos

The web-based mindfulness yoga videos used for the intervention were created by a professional yoga instructor who taught a 20-minute class each day for 2 weeks. The focus of this class was to incorporate movement with breathing and self-awareness as a primary mindfulness exercise. The instructor created two videos so that participants could practice during breaks at their workplace or at home. In one video, yoga was practiced while sitting on a chair, and in the other, while lying down at home. Participants could choose either video based on their circumstances. In the sitting yoga video, participants were asked to carefully move each joint to relieve stiffness, which was accompanied by breathing and focusing on and being aware of their mind and body. They also practiced an isometric breathing exercise, which involved holding a position while slowly breathing in and out. In the lying yoga video, although the purpose, effects, and elements were the same as the sitting yoga video, different poses were introduced during the isometric breathing exercise.

2.2.2. Insomnia Severity Index (ISI-J)

The ISI was originally developed by Bastien, Vallieres, and Morin [17] to assess the nature, severity, and impact of insomnia and sleep satisfaction. The ISI has been used to examine the clinical significance of insomnia treatment worldwide. In Bastien *et al.*'s study, participants were asked to complete a 5-point Likert scale, ranging from 0 (no problem) to 4 (very severe problem). The ISI has been translated into Japanese, and the translated version (ISI-J) has been validated by Munazawa *et al.* [18] and is frequently used in Japan. The total score of the ISI-J is the sum of seven items, ranging between 0 and 28, with higher scores representing greater severity and impact of insomnia and dissatisfaction with sleep. The internal consistencies of this scale for the Before Intervention stage and the After Intervention stage in the present study were 0.821 and 0.790, respectively.

2.2.3. Caregivers' Belief in Ideal Care (CBIC)

The CBIC scale was developed by Matsumoto (2020) to assess the prevention of maltreatment by care workers for the elderly. For this study, we used a subscale that indicates caregivers' beliefs about what constitutes ideal care. The subscale consists of nine items, such as, 1) I respect elderly clients rather than looking down on them, 2) I am highly motivated to assist my elderly clients, 3) I prioritize client-centered care over time efficiency, and 4) I can provide great care for my client as I would like to be cared for. Participants self-evaluated using a 5-point Likert scale, ranging from 1 = strongly disagree to 5 = strongly agree. We summed all items on the scale; higher scores represented that caregivers maintained a greater belief in ideal care. The Cronbach alpha for this scale for the Before Intervention stage and the After Intervention stage was 0.847 and 0.848, respectively.

2.2.4. Oguri-Shirakawa-Azumi (OSA) Sleep Inventory

Developed by Oguri, Shirakawa, and Azumi [19], the OSA inventory is aimed at elderly individuals who have difficulty responding to questionnaires with several options and who do not have time to complete questionnaires, particularly in clinical or care facility settings. The OSA, which evaluates sleep introspection upon waking, consists of 16 items and is evaluated on a 5-point Likert scale, ranging from 1 = strongly disagree to 5 = strongly agree.

To verify that the OSA inventory was appropriate for the collected data and to ensure the OSA was evaluated in the Before Intervention and After Intervention stages, we performed exploratory factor analyses using unweighted least squares on the OSA in both stages. We extracted the factors with an eigenvalue greater than 1. For the Before Intervention stage, two factors were confirmed: Factor 1 with 13 items and Factor 2 with 3 items. For the After Intervention stage, we conducted the same analysis, but three factors were confirmed: Factor 1 with 7 items, Factor 2 with 5 items, and Factor 3 with 4 items. We selected and summed the items that appeared in the same factor for both stages and created the 6-item Sleep Quality Scale. The extracted items were "I feel" (a) tired, (b) refreshed, (c) sluggish, (d) discomfort, (e) clear-minded, and (f) that I slept long enough. The items that belong to Factor 2 in both stages were (a) dreamed and (b) had nightmares.

Since Factor 2 is not part of our study purpose, we did not test it. The internal consistencies of this scale for the Before Intervention stage and the After Intervention stage in the present study were 0.867 and 0.828, respectively.

2.3. Statistical Analyses

We analyzed the data using SPSS Statistics 28.0 (SPSS Inc., Chicago, IL). We used a repeated measures ANOVA to test the impact of the web-based mindfulness yoga intervention and assess the patterns of changes in the ISI-J, CBIC, and OSA by comparing the Before Intervention and After Intervention stages.

3. Results

Regarding participants' levels of insomnia, the difference between the two stages was significant ($F = 9.83$; $p = 0.004$, partial eta-squared = 0.274). The results showed that participants' levels of insomnia decreased after they participated in the web-based yoga intervention for two weeks compared to when they did not. To assess the caregivers' belief in the ideal care of their clients, we again performed a repeated measures ANOVA; the results indicated that the difference between the two stages was significant ($F = 5.37$; $p = 0.03$; partial eta-squared = 0.171). After the intervention, participants showed greater belief in the ideal care of their clients. Regarding sleep quality, the results of a repeated measures ANOVA showed that there was a significant difference between the two stages ($F = 7.17$; $p = 0.013$; partial eta-squared = 0.238). That is, the respondents' sleep quality improved after the intervention. Align with our hypotheses, web-based mindfulness yoga did significantly improve insomnia, sleep quality, and caregivers' belief in ideal care. See the summary of the means and standard deviations of the dependent variables for pre- and post-interventions (Table 1).

Table 1. The means and standard deviations of the dependent measures for before and after interventions.

	Pre-Intervention	Post-Intervention
ISI	8.93 (5.12)	6.96 (3.78)
CBIC	32.67 (5.51)	34.04 (5.38)
OSA	15.80 (4.44)	13.76 (3.56)

Note: ISI: Insomnia Severity Index; CBIC: Caregivers' Belief in Ideal Care; OSA: Oguri-Shirakawa-Azumi (OSA) Sleep Inventory.

4. Discussion

The purpose of the present study was to investigate the effects of a web-based mindfulness yoga intervention on caregivers' levels of insomnia, belief in ideal care, and sleep quality using a repeated measure analysis. A total of 27 caregivers practiced web-based mindfulness yoga for 20 minutes each day for 2 weeks. We analyzed the impact of the intervention by comparing the Before Intervention

stage and the After Intervention stage. As no previous studies have investigated the impact of web-based mindfulness yoga on caregivers' levels of insomnia, belief in ideal care, and sleep quality, we believe the present study contributes to current literature.

As hypothesized, the level of insomnia, belief in ideal care, and sleep quality improved after participants engaged in web-based mindfulness yoga intervention. Sleep quality is significantly associated with caregivers' physical and psychological health and quality of life [20]. Additionally, poor quality of sleep can diminish caregivers' ability to provide ideal care for their clients, which may put the care recipient at risk of neglect or medication and treatment errors [21]. As Gao *et al.* [22] found in their meta-analyses of 35 studies, sleep quality was significantly lower for professional caregivers, but those who participated in sleep intervention trials experienced better sleep quality than those who did not receive any intervention. Our study confirms the crucial role of intervention programs, such as web-based mindfulness yoga, to address caregivers' insomnia and lack of sleep quality. One of the benefits for participants was that they could practice the intervention during their breaks at work or at home as the web-based program i was delivered asynchronously (via prerecorded material). The intervention is cost- and time-effective and easily accessible for busy caregivers of the elderly, who work under extreme stress and pressure.

We also found that web-based mindfulness yoga programs improve caregivers' belief in ideal care. That is, their beliefs in ideal care, such as their desire to respect their clients, motivation to work, prioritization of client-centered care, and desire to provide care in the way they would like to be cared for improved by participating in the intervention. Similar to self-efficacy, which is defined as one's belief in their ability to complete specific tasks or behaviors, improving their desire and motivation for providing optimal care for their clients may be a key factor in preventing adverse effects on their psychological and physical well-being [23]. Indeed, a recent study concluded that fostering such desire and motivation for caring for elderly clients was associated with reduced turnover rates and work-related injuries and accidents among caregivers [24]. Therefore, it is crucial to improve caregivers' desire and motivation to provide optimal care, which can be strengthened by a web-based mindfulness yoga program.

There are some limitations of this study. Using a systemic review, James-Palmer *et al.* [25], this study used an asynchronous delivery method (via prerecorded material), which means that the yoga instructor could not see the entire group to provide feedback. Although we provided participants with daily diaries to note their progress and question items related to any adverse events during practice, safety measures that in-person delivery methods cannot be guaranteed for both synchronous and asynchronous delivery methods. Participants in our study reported no accidents or injuries; however, it is essential to consider participants' physical abilities and their familiarity with yoga before beginning an intervention. We also recognized that all of our surveys were self-reported measures. Future studies should include objective measurements to assess sleep quality. Further, it

would be better to include objective measures of sleep quality, such as actigraphy or polysomnography, to complement self-report data and provide a more comprehensive assessment of sleep outcomes. This would mitigate potential biases associated with self-reported data. Finally, within-subject design has some inherent disadvantages, such as carryover (in which the effects of a previous treatment influence the outcomes of subsequent treatments) and demand effects (in which participants interpret the experimenter's intentions and alter their behavior accordingly, whether consciously or unconsciously) [26]. Therefore, it is necessary to conduct randomized control intervention.

5. Conclusion

In the present study, we examined the effects of a web-based mindfulness yoga intervention program on participants' levels of insomnia, belief in caregivers' ideal care, and sleep quality by comparing the Before Intervention stage and the After Intervention stage. Web-based interventions are beneficial for individuals of all ages because they are accessible, convenient, private, cost-effective, and can impact on a large scale. Furthermore, given that alleviating insomnia, improving/maintaining belief in ideal care, and improving sleep quality may be associated with mitigating turnover rates and preventing maltreatment of elderly clients, this study has added to the current literature by discussing the crucial roles of web-based intervention programs. We found that the web-based mindfulness yoga program was an effective intervention for improving insomnia, caregivers' belief in ideal care, and sleep quality. We hope that our findings will encourage caregiver facilities to provide web-based intervention programs that caregivers can practice during breaks at their workplace or at home.

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Ethics Approval and Consent to Participate

This study was approved by the Institutional Review Board from Fukuoka University, and all participants gave signed consent to participate in this study.

Data Availability Statement

Data is registered at Open Science Framework.

Author Contributions

Kukihara contributed to the conception and design of this study. Koga, Nishino,

Nakashima, and Ando collected data and made critical contributions to the paper's intellectual content. The first manuscript draft was written by Kukihara and Yamawaki, who are the equal authors of this article and contributed to the data analysis. They are responsible for the final manuscript. All the authors have read and approved the final manuscript.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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