Volume 4, No. 11 November 2026
pp. 1955-1967
e-ISSN 3031-5786
DOI: https://doi.org/ 10.46799/adv.v4i11.719

ADVANCES IN SOCIAL HUMANITIES RESEARCH

The Effectiveness of Yoga and Meditation on the Intensity and Frequency of Headaches in the DHSP Bali Yoga Community

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Keywords:
yoga, meditation, headaches, NPRS, MIDAS scores

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Abstract

Headaches, particularly migraine and tension-type headaches, are among the most prevalent neurological disorders worldwide and major contributors to disability, adversely affecting quality of life and productivity. Although pharmacological treatments are effective, prolonged or excessive use of certain medications may cause adverse effects and medication-overuse headaches, increasing interest in nonpharmacological interventions such as yoga and meditation. This study aimed to evaluate the effectiveness of a three-month yoga and meditation program in reducing headache intensity, frequency, and related disability among members of the DHSP Bali Yoga Community. A prospective cohort study was conducted from April to September 2026, involving 33 participants aged 31–81 years who experienced headaches. Participants practiced yoga and meditation twice weekly for three consecutive months. Headache-related disability was assessed using the Migraine Disability Assessment (MIDAS) questionnaire, while pain intensity was measured using the Numeric Pain Rating Scale (NPRS). Data were analyzed using the Wilcoxon signed-rank test in IBM SPSS Statistics, version 31.0. The participants' mean age was 57 years (SD = 11.15), and the mean baseline NPRS score was 2.91 (SD = 1.10). Before the intervention, 57.6% of participants experienced moderate headache-related disability, while 3.0% experienced severe disability. After three months, 66.7% reported no headache-related disability, and 30.3% reported mild disability. MIDAS scores decreased in 28 of the 33 participants, with a statistically significant overall reduction ($p < 0.001$). These findings suggested that practicing yoga and meditation twice weekly for three months was associated with reduced headache-related disability. Yoga and meditation may therefore serve as accessible, low-cost complementary approaches to headache management, although controlled studies are needed to establish their effectiveness in reducing headache intensity and frequency.

INTRODUCTION

Headache disorders are among the most prevalent neurological conditions worldwide and are major contributors to the global burden of disability (Ding et al., 2022; Leonardi et al., 2024; Wijeratne et al., 2025). According to the Global Burden of Disease Study, migraine ranks among the leading causes of years lived with disability (YLDs), particularly among working-

age populations (GBD 2021 Nervous System Disorders Collaborators, 2024). These disorders substantially affect quality of life, occupational productivity, and socioeconomic well-being.

Migraine affects approximately 14–15% of the global population, whereas tension-type headache has a higher estimated prevalence of 30–40% (Stovner et al., 2022). Headache disorders may present with symptoms such as unilateral throbbing pain, photophobia, phonophobia, nausea, and limitations in daily activities, particularly in individuals experiencing migraine (Aguilar-Shea et al., 2022).

Headache management commonly involves pharmacological treatments, including nonsteroidal anti-inflammatory drugs (NSAIDs) and triptans for acute attacks, as well as preventive medications such as beta-blockers, anticonvulsants, and certain antidepressants (Aguilar-Shea et al., 2022). Although these treatments can effectively alleviate headache symptoms, prolonged or excessive use of certain medications may cause adverse effects, including gastrointestinal complications and medication-overuse headache (Ashina et al., 2023).

Given these limitations, nonpharmacological interventions have received increasing attention as complementary approaches to headache management (Reina-Varona et al., 2024). Yoga and meditation are among the most widely investigated mind-body practices, incorporating physical postures, breathing regulation, focused attention, and mindfulness techniques. These practices may enhance attentional control, body awareness, and emotional regulation (Tang et al., 2015). Previous studies have suggested that yoga and meditation can reduce psychological stress, improve mental well-being, and influence pain perception (Pascoe et al., 2020).

According to the International Classification of Headache Disorders, third edition (ICHD-3), headache disorders are broadly classified as primary or secondary (Headache Classification Committee of the International Headache Society [IHS], 2018). Primary headache disorders include migraine, tension-type headache, and cluster headache, whereas secondary headaches are attributed to underlying conditions such as head trauma, infections, or vascular disorders. Migraine and tension-type headache are among the most prevalent primary headache disorders (Stovner et al., 2022). Psychological stress, sleep disturbances, hormonal fluctuations, excessive caffeine consumption, and irregular physical activity may contribute to headache occurrence or exacerbation. Furthermore, psychological conditions such as anxiety and depression have been associated with increased migraine frequency and disease burden.

Yoga is a mind-body practice that integrates physical postures (asana), breathing techniques (pranayama), meditation, and mindfulness to promote physical and psychological well-being (Sullivan et al., 2018). Originating from ancient Indian traditions, yoga has evolved into a widely practiced complementary intervention within integrative health care. Its combination of physical activity, breathing regulation, and meditative techniques may influence musculoskeletal function, cardiovascular regulation, and stress responses (Sullivan et al., 2018). Previous research has associated yoga practice with improved flexibility, reduced psychological stress, enhanced well-being, and better quality of life (Nayar et al., 2022). Consequently, yoga has been increasingly investigated as a complementary intervention for

chronic pain, anxiety, sleep disturbances, migraine, and other headache disorders (Kumari et al., 2022; Long et al., 2022; Wu et al., 2022).

Yoga and meditation may influence pain perception through improved attentional regulation, reduced emotional reactivity, and enhanced cognitive modulation of painful sensations (Tang et al., 2015). Experimental studies have suggested that meditation can reduce perceived pain intensity and improve tolerance to painful stimuli (Wells et al., 2021). Neuroimaging research has also demonstrated changes in neural activity within regions involved in the cognitive and emotional processing of pain during meditation (Tang et al., 2015). These findings suggest that mind-body interventions may influence both the sensory and affective dimensions of headache-related pain.

Mindfulness meditation emphasizes sustained, nonjudgmental attention to present-moment experiences, including bodily sensations, breathing, and thoughts. One widely investigated clinical intervention is Mindfulness-Based Stress Reduction (MBSR), developed by Jon Kabat-Zinn (Wells et al., 2021). This structured program typically lasts eight weeks and incorporates mindfulness meditation, body scanning, and gentle yoga exercises. Neuroimaging studies have suggested that meditation may modulate activity in brain regions associated with attention, emotion regulation, and pain processing, including the prefrontal cortex, anterior cingulate cortex, insula, and hippocampus (Hölzel et al., 2011; Tang et al., 2015). Meditation has also been associated with altered activity in the default mode network, which is involved in self-referential processing and spontaneous thought (Hölzel et al., 2011). Additionally, meditation may influence functional connectivity within neural networks responsible for attentional regulation and cognitive control (Taren et al., 2015).

Previous experimental investigations have further indicated that meditation may reduce pain intensity and improve tolerance to painful stimuli, although the magnitude and consistency of these effects vary across studies (Wells et al., 2021). Neuroimaging findings have also suggested that meditation can modify neural responses associated with the emotional evaluation of pain (Tang et al., 2015). These potential mechanisms support further investigation of meditation as a complementary intervention for headache management.

Yoga has been associated with several health benefits, including reduced stress, improved flexibility, better sleep quality, and decreased chronic pain symptoms (Carolina et al., 2023; Panjwani et al., 2021). In individuals with migraine, yoga-based interventions have demonstrated potential benefits in reducing headache frequency and improving quality of life (Long et al., 2022; Wu et al., 2022). These effects may be partly associated with autonomic nervous system regulation, including increased parasympathetic activity and reduced physiological stress responses (Sullivan et al., 2018; Sujan et al., 2025).

Several randomized controlled trials have investigated the effectiveness of yoga and meditation in managing migraine symptoms and improving patients' quality of life. Wells et al. (2021) examined an eight-week mindfulness-based intervention and reported improvements in migraine-related outcomes and daily functioning. Other studies have suggested that yoga and meditation may reduce psychological stress and strengthen coping strategies among individuals experiencing chronic migraine (Nayar et al., 2022). However, differences in intervention

duration, participant characteristics, and outcome measures have contributed to variations in the reported findings.

Although previous research has demonstrated the potential benefits of yoga and meditation for headache management, evidence regarding their effectiveness in community-based settings remains limited. In particular, further investigation is needed to determine whether regular participation in combined yoga and meditation practices is associated with improvements in headache intensity, frequency, and headache-related disability among community members. Therefore, this study aimed to evaluate changes in headache intensity, frequency, and related disability following a three-month yoga and meditation program among members of the DHSP Bali Yoga Community. The findings were expected to provide additional evidence regarding the potential role of community-based mind-body practices as complementary approaches to headache management (Reina-Varona et al., 2024).

METHOD

Research Time and Location

The research location will be held in the DHSP Bali Community, Banjar Singin, Selemadeg, Tabanan with a time starting from April to September 2026.

Research Design

This study is a prospective cohort study of the DHSP Bali population who experienced headaches with an age range of 31-81 years during the period April to September 2026. The study sample measured MIDAS and NPRS headaches in April 2026 and then followed regular yoga and meditation practices twice a week for three consecutive months. At the end of the July 2026 session, the sample was remeasured with MIDAS scores to determine the improvement in headache symptoms and complaints.

Population and Research Sample

The population in this study is members of the DHSP Bali community who experience headaches. The research sample is a research population that meets the inclusion and exclusion criteria. The sample was taken by consecutive sampling method and using primary data with the MIDAS scoring method in the form of a questionnaire with a categorical scale based on the frequency and intensity that has been standardized as a measure of the severity of headaches.

Inclusion Criteria

The inclusion criteria for this study were members of the DHSP Bali community who experienced headaches who routinely did yoga and meditation twice every week for 3 months during the April-July 2026 period.

Exclusion Criteria

The exclusion criteria for this study include participants with serious physical diseases, such as visual impairment (e.g. cataracts) or other chronic diseases, patients with severe mental disorders (e.g. schizophrenia or other organic mental disorders), uncooperative participants, certain neurological diseases (epilepsy or autism), and participants who do not practice regularly or quit before the implementation of the research is completed.

Research Tools and Materials

The tool used in the study was the Migraine Disability Assessment (MIDAS) questionnaire to measure the impact of headache severity and evaluation of quality of life after routine meditation and yoga on a categorical scale. Data from filling out the MIDAS questionnaire by members of the DHSP Bali community who experienced headaches, then monitoring of the improvement in MIDAS scores after 3 months of routine yoga and traditional meditation practice. The results of the questionnaire were then tabulated and processed statistically.

Data Analysis

Data analysis was performed using SPSS (version 31.0, SPSS Inc., Chicago, IL, USA). Descriptive statistical tests were performed to describe the basic characteristics of counseling participants and the frequency distribution of various variables. The Shapiro-Wilk test was used to evaluate the distribution of continuous variables in a small sample of research numbers of less than 50 people. Normally distributed data were represented as mean ± standard deviation (SD), abnormally distributed data were expressed as median [interquartile range], and categorical variables were presented as frequency and n (%). Data were analyzed using the WIlcoxon test to see changes in MIDAS scores before and after meditation and yoga for 3 months to assess clinical improvement in headaches.

RESULTS AND DISCUSSION

This study was followed by 33 research subjects who met the inclusion and exclusion criteria. The basic characteristics of the research subjects are presented in table 1 below

Table 1. Subject characteristics

Variable		Number (n) (+SD)	P value
Age (years)	Average	57 (±11,15)	0,200*
	Oldest age	81	
	Youngest age	31	
Gender (n, %)	Male	18 (54,5%)	
	Women	15 (45,5%)	
NPRS	Average	2.91 (±1.1)	< 0.001*
	Highest NPRS	6	
	lowest NPRS	2	

*Shapiro-Wilk data normality test

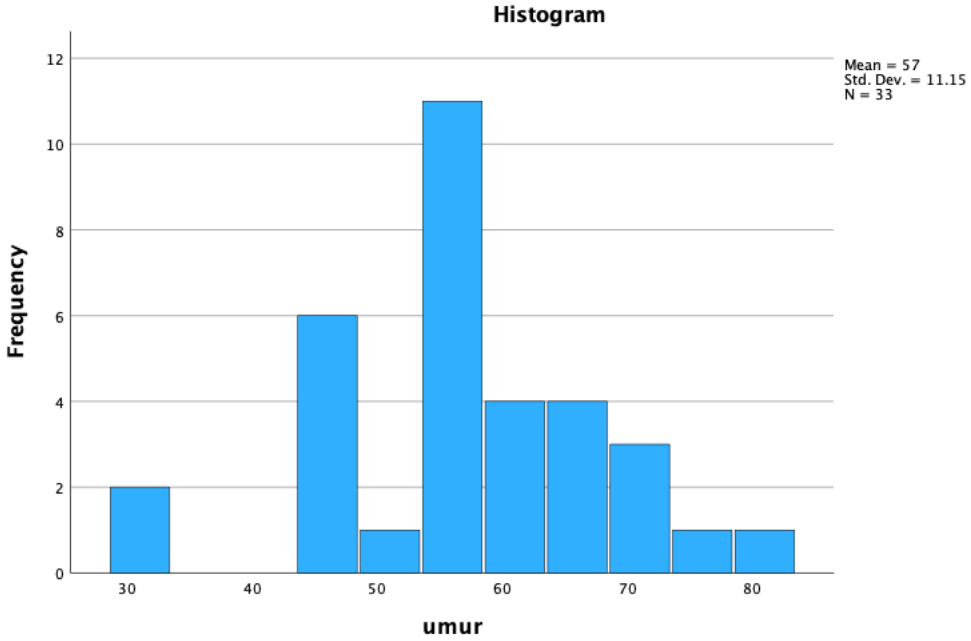


Figure 1. Distribution of age data

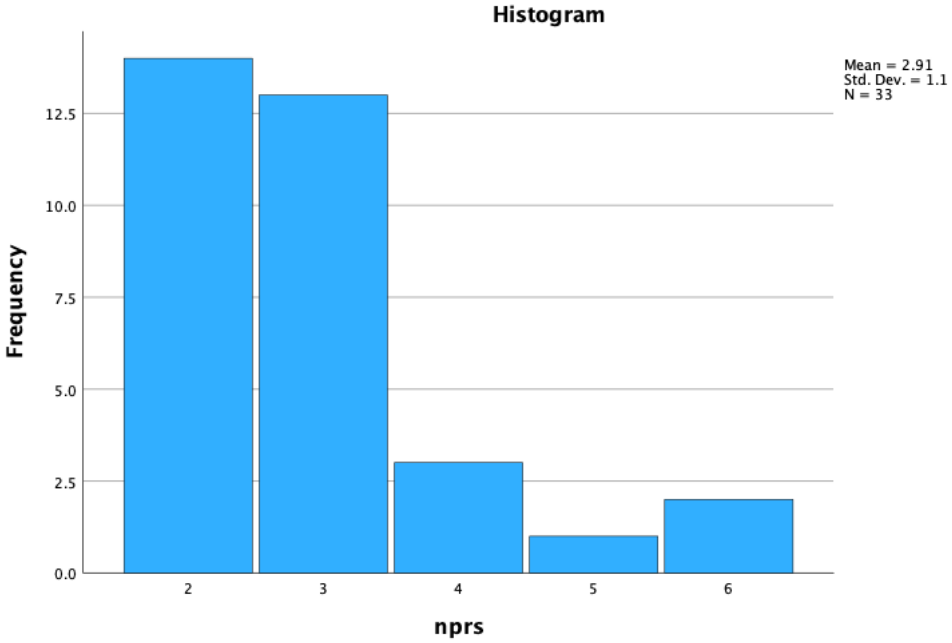


Figure 2. Distribution of NPRS data

From table 1 and figure 1, it was found that the average age of the subjects was 57 years (SD±11.15) (p = 0.200) with the oldest age of the study subjects being 81 years old and the youngest age being 31 years. The gender of the study subjects was 18 males (54.5%) and 15 females (45.5%). From figure 2, it can be seen that the average NPRS score is mild pain 2.91 (SD±1.1) with the highest pain scale of 6 and the lowest pain scale 2.

Table 2. MIDAS Score Frequency before and after meditation and yoga

Variable		Quantity (%)
MIDAS score before meditation and yoga	No disability	4 (12,1%)
	Lightweight	9 (27,3%)
	Medium	19 (57,6%)
	Weight	1 (3,0%)
MIDAS score after meditation and yoga	No disability	22 (66,7%)
	Lightweight	10 (30,3%)
	Medium	1 (3,0%)
	Weight	0 (0%)

From table 2 and figure 3, data were obtained as many as 19 people (57.6%) experienced migraine headaches with moderate disability, 9 people with mild disabilities (27.3%), 4 people without disabilities (12.1%), and only 1 person with severe disabilities (3.0%) before doing yoga and meditation programs. As shown in Figure 4, after doing a yoga and meditation program for 3 months regularly, as many as 22 people (66.7%) did not have disabilities, 10 people (30.3%) had mild disabilities, 1 person (3.0%) had moderate disabilities, and no one had severe disabilities

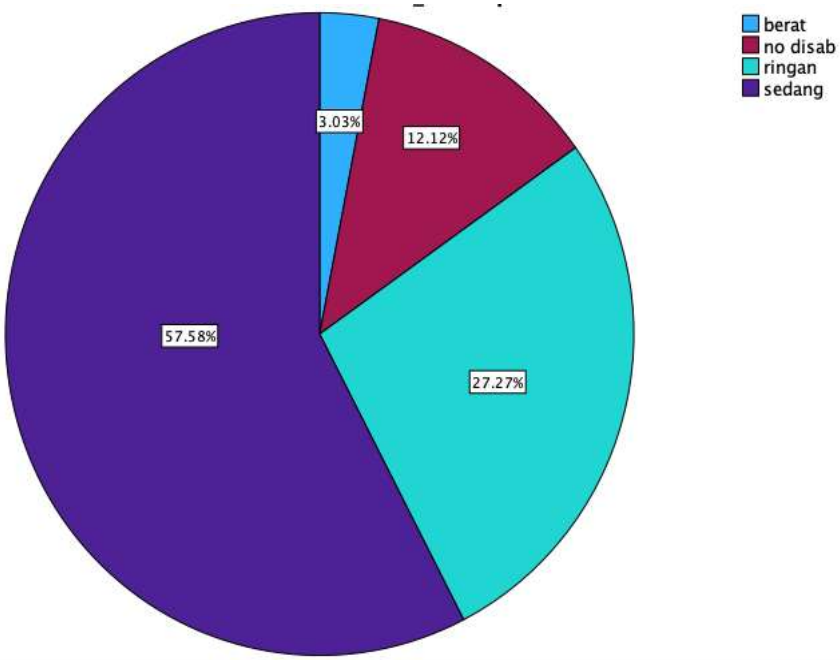


Figure 3. Frequency of MIDAS scores before yoga and meditation

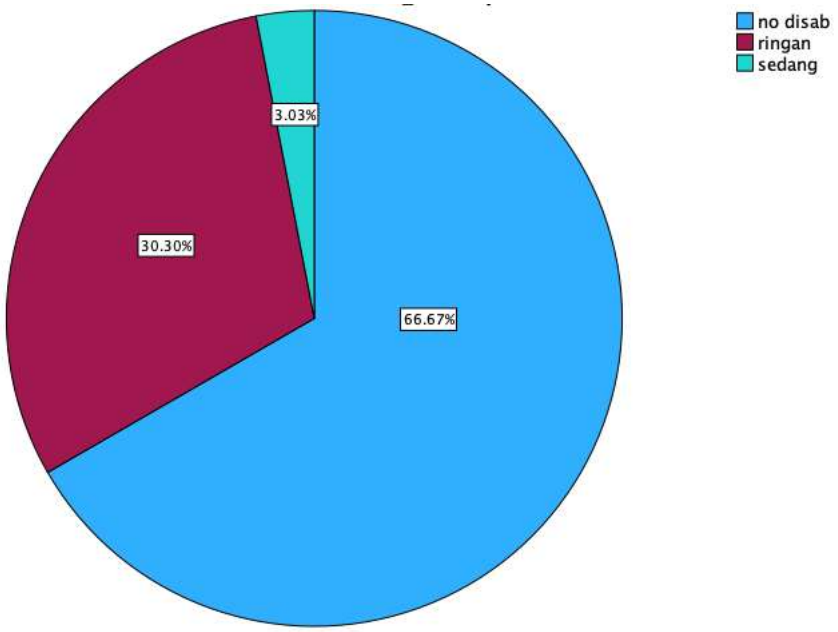


Figure 4. Frequency of MIDAS scores after yoga and meditation

Table 3 The Wilcoxon test paired MIDAS scores before and after meditation and yoga

Variable	Categories	Quantity (n)	p
MIDAS score before-after meditation and yoga	Negative	28	< 0.001
	Positive	2	
	Ties	3	
	Total	33	

From table 3, data was obtained that there was a significant decrease in MIDAS scores of 28 participants after doing meditation and yoga ($p< 0.001$). A total of 2 participants actually experienced an increase in MIDAS scores after doing meditation and yoga. There were 3 participants who did not experience changes after doing meditation and yoga programs.

The results of the main analysis showed a statistically significant decrease in Migraine Disability Assessment (MIDAS) scores ($p < 0.001$) in 28 of 33 participants after undergoing the intervention. These findings prove that the combination of physical exercise (asana), breathing techniques (pranayama), and mindfulness meditation is able to modulate the perception of headaches and significantly reduce the level of functional disability it causes.

From the demographic aspect, the subjects in this study had an average age of 57 years with a fairly wide range, namely 31 to 81 years. The gender distribution was relatively balanced with a percentage of males of 54.5% and females of 45.5%. Interestingly, the average intensity of the subjects' initial pain based on the Numeric Rating Scale (NPRS) was in the category of mild pain, which was 2.91. This low initial NPRS score is likely influenced by the characteristics of the population taken from the yoga community, where some members may already have better coping mechanisms or pain adaptation than the general clinical population in hospitals. However, although the intensity of daily pain was relatively mild, most subjects before the intervention actually experienced moderate (57.6%) to severe functional disabilities (3.0%) based on the MIDAS score. This confirms that the burden due to headaches is not only

determined by the peak of momentary pain intensity, but also by the frequency of attacks and their cumulative impact on productivity and daily activities.

The effectiveness of mind-body therapy-based interventions in reducing headache disability in this study is in line with the clinical evidence on yoga and meditation for primary headache disorders summarized in the Introduction.

Domestically, these findings are also parallel to reports from Hastuti and Andriyani (2020) which examined the impact of yoga exercises on headache complaints in the elderly population. Although the age group in the study tended to be more homogeneous in the elderly, the decrease in headache complaints obtained confirmed that adaptive yoga practice was safe and effective across various age groups of subjects, including mature age groups, as well as the average sample in this study at DHSP Bali (57 years).

Furthermore, the mindfulness component of the study played a crucial role in changing patients' psychological responses to pain. Through regular exercise twice a week for 3 months, subjects in this study were trained to respond to pain consciously without judgment (non-judgmental awareness), which ultimately reduced the impact of psychosocial disabilities measured through the MIDAS questionnaire.

The success of reducing headache disability through yoga and meditation interventions can be explained through comprehensive neurophysiological mechanisms. Primary headache disorders such as migraine and TTH are closely related to autonomic nervous system dysregulation (SSO) and cortical hyperexcitability. Neurophysiologically, yoga movements (asana) and breath regulation (pranayama) work by shifting the dominance of the nervous system from the sympathetic pathway (fight-or-flight response) to the parasympathetic nervous system (rest-and-digest response). Based on the Polyvagal Theory reviewed by Sullivan et al. (2018), stimulation of the vagus nerve during yoga practice directly induces systemic relaxation, lowers blood cortisol levels, and increases gamma-aminobutyric acid (GABA) levels in the cerebral cortex. The increase in GABA as the main neurotransmitter inhibitor functions to reduce mental overactivity and hyperexcitability of the central nervous system which often triggers neurogenic inflammation in the trigeminovenvascular nociceptive pathway.

From a neuroscience perspective, the positive neuroplasticity generated by meditation structurally modulates the brain areas responsible for emotional perception and evaluation of pain. Neuroimaging research by Tang et al. (2015) showed that regular meditation induces structural and functional changes in the areas of the prefrontal cortex, anterior cingulate cortex, insula, and hippocampus. Increased gray matter volume in these areas is directly correlated with a strengthening of cognitive control over physical sensations of pain.

In addition, meditation has been shown to decrease functional activity in the Default Mode Network (DMN) and suppress amygdala reactivity. Decreased DMN activity—the brain network that is active when a person is daydreaming or experiencing anxiety—helps break the mind-wandering chain and suppresses the overthinking process. Taren et al. (2015) showed that mindfulness interventions reduce the functional connectivity of stress-sensitive amygdala. This decrease in the functional volume of the amygdala automatically lowers anxiety, stops pain catastrophization, and improves conscious emotion regulation. The integration of

autonomic to parasympathetic diversion as well as DMN suppression is the basis why the frequency of attacks and the level of disability (MIDAS score) of DHSP Bali subjects can be massively reduced after the intervention.

Although the majority of subjects (28 people) showed excellent clinical responses, the study noted an anomaly in a small number of subjects: there were 2 participants who experienced an increase in MIDAS scores and 3 participants who experienced no change at all. This phenomenon can be influenced by several confounding factors that were not strictly controlled in the design of this cohort, such as the level of acute psychosocial stress outside of the training session (e.g. work or family problems), adherence to the quality of self-training at home, the severity of the underlying structural pathology of headaches, and the variability of emergency analgesic medication consumption during the observation period.

This study also has several limitations that need to be acknowledged. First, the relatively small sample size (n = 33) and the selection of non-probability samples (consecutive sampling) in one specific community in Bali can limit the generalisability of the results of this study to the wider clinical population. Second, the design of a prospective cohort study without a comparative control group (non-controlled study) makes it impossible for researchers to completely rule out the placebo effect or natural improvement over time (natural history of the disease). Third, the MIDAS and NPRS instruments are highly dependent on the memory and subjectivity of the participants (recall bias).

CONCLUSION

This study demonstrated that participation in a combined yoga and meditation program twice weekly for three months was associated with a significant reduction in headache-related disability among members of the DHSP Bali Yoga Community. The reduction in Migraine Disability Assessment (MIDAS) scores ($p < 0.001$) indicated improvements in headache-related functional outcomes. These findings may be explained by potential neurophysiological mechanisms, including enhanced parasympathetic nervous system activity and changes in neural networks involved in emotional regulation and pain perception, such as the default mode network (DMN) and amygdala. However, these mechanisms were not directly assessed in this study.

Regular yoga and meditation may serve as accessible, low-cost complementary approaches to community-based headache management. The findings suggest that these nonpharmacological practices could be integrated with conventional medical treatments to improve headache-related functioning. However, their effectiveness in reducing headache intensity, frequency, and medication-overuse headache risk requires further investigation.

Future research should employ randomized controlled trial (RCT) designs with parallel control groups, larger sample sizes, and follow-up assessments beyond three months to evaluate the long-term effectiveness and sustainability of the observed improvements.

FUNDING

This research does not receive special funding from government, private, or other organizations.

CONFLICT OF INTEREST

The authors state that there is no conflict of interest in the research, writing, or publication of this article.

AUTHOR'S CONTRIBUTION

All authors contributed to the preparation of this article. Author 1 (Putu Setiani) played a role in the conceptualization of the research, played a role in the collection and analysis of data, played a role in the interpretation of the results and the preparation of the manuscript, while the other author contributed to the review, editing, and final approval of the manuscript.

GENERATIVE ARTIFICIAL INTELLIGENCE USAGE STATEMENT

The author states that no generative artificial intelligence was used in the preparation of this article.

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