

## Effects of Multi-modal Rehabilitation Approach in Headache-related Anxiety and Depression

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### Abstract

**Background:** A comprehensive, multi-modal rehabilitation that addresses both the physical and mental health aspects of headache disorders has the potential to give more effective relief and improve patients' overall quality of life. Further studies are required to determine the most beneficial exercise modalities and incorporate them into a comprehensive treatment strategy for headache-related anxiety and depression.

**Methodology:** A multi-modal rehabilitation was administered for 8 weeks. Participants engaged in 45 minutes of supervised aerobic exercises three times/week. A dry needling session was performed for 30 minutes on the trigger points associated with neck pain, while massage was performed to reduce muscle tension in the head, neck and shoulder regions, lasting for 30 minutes.

**Results:** The outcome measures assessed at baseline revealed that the pain intensity as measured using VAS was  $7.3 \pm 1.3$ , the value of headache impact test (HIT) was  $55.3 \pm 1.4$  and HADS-Anxiety and Depression was  $16.32 \pm 1.56$  and  $15.35 \pm 1.47$  respectively, that was significantly reduced to  $3.26 \pm 1.25$  (VAS),  $35.6 \pm 1.21$  (HIT) and  $10.32 \pm 1.52$  (HAD-A) and  $9.56 \pm 1.2$  (HAD-D) respectively after eight week of multi-modal rehabilitation.

**Conclusion:** The findings of this study demonstrated that a multi-modal rehabilitation intervention, comprising aerobic exercises, dry needling, and massage therapy, significantly reduces headache-related pain intensity, anxiety and depression in patients with primary headache disorders.

### Keywords

*Anxiety, Depression, Exercise, Headaches.*



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## Introduction

According to the Global Burden of Diseases, Injuries, and Risk Factors Study (GBD) 2019, headache disorders rank third among 369 conditions in terms of years lived with disability (YLDs) for both sexes and first for those aged 15 to 49, accounting for 8% of YLDs across all causes<sup>1-2</sup>. This indicates that headache disorders are a significant cause of disability, amongst which migraines ranked second place, accounting for 7.3% of YLDs overall. However, the comorbidity correction, which relies on the independent distribution of these illnesses, might skew GBD estimations<sup>3-4</sup>. This is especially important for headaches since they frequently co-occur with several other conditions<sup>5</sup>.

Numerous neurological, metabolic, and cardiovascular problems, such as stroke, epilepsy, multiple sclerosis, obesity, diabetes, hypertension, and sleep disorders, are commonly linked to primary headache disorders<sup>6</sup>. Furthermore, headaches and mental health challenges such as anxiety and depression frequently coexist. Nevertheless, there are situations where these mental health comorbidities are not well characterized, leading to the possibility that they are only signs of headache disease<sup>7</sup>. Anxiety and depression, in particular, are frequently comorbid with headache disorders. The presence of these mental health conditions can exacerbate the experience of headaches, increasing the overall burden of disability<sup>8</sup>. Headaches, especially migraines, are often accompanied by significant psychological distress. Anxiety and depression not only increase the frequency and severity of headaches but also contribute to a higher overall burden of disability and cost for societies. This interconnectedness underscores the importance of addressing both the physical and mental health aspects of headache disorders to alleviate their comprehensive impact on individuals and society<sup>9-10</sup>.

Headaches are one of the most common causes of people seeking medical care worldwide, causing more disability than any other neurological issue. About 80% of the population annually experiences at least one headache episode, and 10%–20% consult a physician with headache as their primary complaint<sup>11-12</sup>. Headaches rank among the top ten most disabling conditions for both men and women globally, significantly diminishing quality of life. Despite the frequent medical consultations, most diagnostic evaluations for common headache complaints yield negative results, which can be frustrating for patients and physicians<sup>13</sup>.

Exercise is a crucial approach for alleviating chronic pain and primary headaches. Aerobic exercises are thought to cause hypoalgesia via descending inhibitory nociceptive pathways and the production of beta-endorphins and endocannabinoids<sup>14</sup>. Exercise can also alter pain's autonomic, emotional, and cognitive elements. Experiments have shown that exercise decreases primary headache disability and improves the frequency, severity, and length of headache

attacks<sup>15</sup>. However, it is still being determined which specific exercise modalities or prescription parameters are the most helpful, as several approaches have been suggested. Given the complexity of headache disorders and their frequent comorbidity with anxiety and depression, there is a need for a multimodal rehabilitation approach. This approach may involve the physical and mental health of the headache disorders and could provide more effective alleviation and improvement in patients' overall quality of life. Additional research is required to outline which exercise modalities are most effective and integrate them into the general management of headache-related consequences.

## Methodology

### *Study Design*

This was a quasi-experimental design aimed at assessing the effectiveness of multi-modal rehabilitation, which included aerobic exercises, dry needling and massage on headache and associated anxiety and depression.

### *Study Setting and Participants*

This study was carried out at a clinical setup of the Al Shaa Physiotherapy Center of Karachi, which provided all the relevant facilities like a gym and a separate room for doing dry needling and massage. A total sample size of 40 was selected through purposive sampling with the following criteria:

- Patients diagnosed with primary headache disorders, including tension-type headache (TTH) and migraine, based on the criteria outlined in the International Classification of Headache Disorders 3, aged 25-45 years, who experienced at least one headache episode per week for the past three months and willing to participate in a 12-week physical therapy intervention program were included.
- Individuals with secondary headaches due to underlying medical conditions, having severe psychiatric disorders that might interfere with participation, previous head or neck surgery within the past year, currently undergoing another form of headache treatment or physical therapy or being pregnant were excluded.

### *Multi-modal Approach to Intervention*

The multi-modal rehabilitation was comprised of the following interventions administered for 8 weeks:

**Aerobic Exercises:** The participant's multi-modal aerobic exercise sessions 3 times/week. Each session lasted 45 minutes following this regime:

- 5-minute warm-up with light stretching and low-intensity activities. 30 minutes of moderate-intensity aerobic exercise—for example, treadmill walking, cycling, or elliptical training, maintaining 60-70% of maximum heart rate.
- 10 minutes cool-down with stretching exercises.

**Dry Needling:** The subjects received a once-weekly dry needling treatment by a licensed physical therapist. Each session lasted 30 minutes, and the treatment zones included only common, specifically associated trigger points of headache pain—neck, shoulders, and upper back.

**Massage:** The participants attended massage therapy sessions twice a week, 30 minutes each. The agenda was focused on myofascial release and some relaxation methods that were targeted to reduce the tension in the head, neck, and shoulder muscles.

## ***Outcome Measures***

### **Assessment of Pain**

- **Headache Impact Test (HIT-6):** This assessed the impact of headaches on the participant's life concerning pain severity and the influence of headaches upon daily activities, amongst others.
- **Visual Analogue Scale (VAS):** Participants were asked to rate headache intensity from 0–10 on a VAS scale before and after each session and once a week.

### **Anxiety and Depression Assessment**

- **Hospital Anxiety and Depression Scale (HADS):** This 14-item scale measured participants' levels of anxiety and depression, which comprised a 7-item HADS-A for anxiety and a 7-item HADS-D for depression.

## ***Data Analysis***

Descriptive statistics were computed to summarize demographic and clinical information about the participants. Paired t-tests were used to compare pre and post-intervention scores on pain, anxiety, and depression scales. Repeated measures ANOVA was used to evaluate changes over time. Statistical significance was set at  $p < 0.05$ .

## ***Ethical Considerations***

Informed consent was obtained from all participants before their inclusion in the study. Participants had the right to withdraw from the study without assigning any reason. The study upholds all the ethical standards as laid down in international guidelines for human subjects.

## Results

The demographic description of the participants revealed that the mean age of the participants was  $40.32 \pm 1.32$ , with a greater number of female participants ( $n=24$ ) than males ( $n=16$ ) (Table 1)

Variables	Mean $\pm$ SD
Age of Participants	40.32 $\pm$ 1.2
<b>Gender n (%)</b>	
Male	16 (40%)
Female	24 (60%)

Further, the values of outcome measures were taken at baseline, and the findings revealed that at baseline, the pain intensity as measured using VAS was  $7.3 \pm 1.3$ , the value of headache impact test (HIT) was  $55.3 \pm 1.4$  and HADS-Anxiety and depression were  $16.32 \pm 1.56$  and  $15.35 \pm 1.47$  respectively (Table-2).

Variables	Mean $\pm$ SD
VAS	7.3 $\pm$ 1.3
HIT	55.3 $\pm$ 1.4
HADS-Anxiety	16.32 $\pm$ 1.56
HADS-Depression	15.35 $\pm$ 1.47

Further pre-post intervention was performed to determine the effects of the intervention on outcome measures, and the finding revealed a significant mean difference in pain intensity, HIT and HADS ( $p < 0.001$ ) (Table-3).

Variables	Mean $\pm$ SD (Baseline)	Mean $\pm$ SD (Post)	t-value	Level of Significance
VAS	7.3 $\pm$ 1.3	3.26 $\pm$ 1.25	4.73	$p < 0.001$
HIT	55.3 $\pm$ 1.4	35.6 $\pm$ 1.21	8.54	$p < 0.001$

HADS-Anxiety	16.32±1.56	10.32±1.52	6.53	p<0.001
HADS-Depression	15.35±1.47	9.56±1.2	5.56	p<0.001

## Discussion

In patients with primary headache problems, the results of this study showed substantial reductions in pain intensity, headache impact, and anxiety and depression levels after multi-modal rehabilitation. VAS indicated a significant decrease in pain intensity following the intervention ( $p<0.001$ ), while HIT also reported a substantial decline in the participant's headaches ( $p<0.001$ ). Furthermore, there were significant improvements in levels of anxiety and symptoms of depression, as evidenced by decreases in the HADS-Anxiety and HADS-Depression scores. These data confirm the efficacy of dry needling, massage therapy, and aerobic exercises as part of basic headache treatment strategies. The significant reductions in headache impact and pain severity suggest that physical therapy approaches effectively alleviate primary headache symptoms.

Furthermore, the observed reductions in anxiety and despair highlight the broader impact of these interventions on individual psychological health. The findings are consistent with previous research emphasizing the benefits of multi-modal pain treatment strategies<sup>16</sup>. Aerobic exercises have been found to cause hypoalgesia and promote the generation of endogenous opioids, both of which serve to alleviate pain. Similarly, trigger points and dry needling treat stiff muscles, which are usually associated with headaches.

These methods provide complete care for those with persistent headaches by addressing the psychological and physical elements of pain<sup>17</sup>. According to systematic reviews and meta-analysis, it was observed that adding exercise to treatment plans may have advantages over and beyond pharmacological ones, such as enhancing the general quality of life and lowering dependency on medications for headache relief<sup>18</sup>. A review article concentrating on non-pharmacological therapies for headaches identified dry needling as a viable intervention due to its lower morbidity and mortality risks and costs compared to pharmaceutical techniques. The efficacy of Slow Stroke Back Massage (SSBM) therapy in reducing headaches was investigated in different research, including individuals with hypertension<sup>18</sup>. This method is thought to lower blood pressure and decrease stress hormones, including cortisol, norepinephrine, and dopamine, while also promoting relaxation. The systolic blood pressure decreased by an average of 10 mmHg after treatment, and on the third day, the pain level also decreased<sup>19</sup>.

The study's quasi-experimental solid design allowed for an excellent evaluation of a multi-modal rehabilitation aimed at treating headache pain along with concomitant anxiety and sadness. Over the weeks, the intervention addressed the physical and psychological components of managing headaches in a controlled clinical environment by combining aerobic exercise, dry needling, and massage. Moreover, since the study had objective outcome measures, including HADS, HIT-6, and VAS—all of which provided reliable quantitative data concerning the intensity of pain, headache impact, and psychic symptoms—this enhanced its internal validity. Several limitations

were present in this research, but its findings demonstrate that multi-modal rehabilitation can improve outcomes in people suffering from primary headache disorders. However, this small sample size of 40 subjects and such a short intervention period are significant limitations from which it may be difficult to generalize and identify long-term benefits. Future studies should, therefore, consider larger cohorts and more extended follow-up periods to validate these initial results.

## Conclusion

The results indicate that the combination of aerobic exercises, dry needling, and massage is quite effective in lowering headache pain intensity and anxiety depression in patients with primary headache disorders. Underlining the efficiency of doing non-pharmacological treatment vis-à-vis primary headaches, these results would offer doctors a sort of holistic approach toward both physical and emotional health.

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None.

### *Conflict of Interest*

None.

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**AUTHORS' CONTRIBUTION**

The following authors have made substantial contributions to the manuscript as under:

**Conception or Design:** Khan R, Latif D, Shahid G

**Acquisition, Analysis or Interpretation of Data:** Khan R, Usman M, Lata P

**Manuscript Writing & Approval:** Latif D, Usman M, Lata P

All the authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.



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