



P-ISSN: 2394-1685
E-ISSN: 2394-1693
Impact Factor (RJIF): 5.38
IJPESH 2024; 11(4): 270-273
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www.kheljournal.com
Received: 01-05-2024
Accepted: 05-06-2024

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Effectiveness of scapular stabilization exercise in improving neck pain and forward head posture: A case series

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Abstract

Neck pain and forward head posture (FHP) are common complaints in the modern population, often worsened by prolonged sitting and poor ergonomics. This study examined the effectiveness of SSE on neck pain and FHP in 10 participants aged 20-50 years. Neck pain and neck function were assessed using the Visual Analog Scale (VAS) and Neck Disability Index (NDI) respectively, before and after the intervention. Following the intervention, VAS and NDI scores improved. The findings demonstrated a significant reduction in pain and improvement in posture. The study concludes that Scapular stabilization exercises (SSE) are an effective intervention for reducing neck pain and improving FHP, highlighting the importance of incorporating these exercises into rehabilitation programs for individuals with neck pain and postural issues.

Keywords: Forward head posture, neck pain, scapular stabilization exercise, visual analogue scale

1. Introduction

Neck pain is defined as unilateral or bilateral discomfort in the cervical spine, potentially radiating to the upper extremities, lasting for a minimum of 24 hours^[1]. The underlying cause of neck pain is complex which includes an inactive lifestyle, awkward posture, increased computer use, physical or mental stress, and working positions which can contribute to neck muscle spasms and pain^[2]. Posture refers to the alignment of the body's parts relative to its position^[3]. Forward head posture (FHP) is a common condition characterized by an excessive forward position of the head relative to the spine. Weakness in the deep cervical flexors and scapular retractors is accompanied by increased tension and thickening of the sternocleidomastoid. Dysfunctional upper scapula leads to hyperactivity of the upper and lower trapezius muscles. This protective response, involving both muscle overactivity and inhibition, can cause neck malalignment, postural imbalances, and ultimately, pain^[4]. Scapular stabilization exercises (SSE) aim to improve scapular control and movement^[5]. SSE involves five stages. In the first stage, the patient lies in a supine position and is instructed to take a deep breath to relax their body while maintaining a comfortable shoulder and neck posture. In stage 2, with knees bent and feet flat, the patient's dominant arm is raised to 90° shoulder flexion with full elbow extension and scapular protraction. Maintain for 10 seconds, before returning to starting position. Repeat 3 sets of 10 repetitions. In stage 3, the patient is in a quadruped position and lifts their arms alternately, performing shoulder abduction with 120° of flexion. Each raised arm position is held for 10 seconds before returning to the starting position. Stage 4 progresses to being seated on a stool or bed without back support, with the knees bent at 90°. Here, the patient holds a pair of 2 kg dumbbells in each hand. The exercise involves raising the arms laterally, but maintaining the scapulae below 80° in height throughout the movement. This scapular position is held for 10 seconds before returning to the starting position. 3 sets of 10 repetitions are performed with a 30-second rest period between sets. Stage 5 focuses on posture awareness and the patient remains seated with a mirror positioned in front of them^[6]. They are instructed to self-assess and correct their posture as needed.

2. Case Description: In this study, a total of 10 participants were enrolled from an outpatient department of a tertiary hospital in South Karnataka, including 7 females and 3 males. The participants' ages ranged from 20 to 50 years. The participants' occupations included housewives, students, shopkeepers, and watchmen. Analysis was conducted based on outcome measures using the Visual Analogue Scale (VAS) for pain and the Neck Disability Index (NDI). This study evaluated neck pain and FHP. Subjects with cervical surgery and cervical spine fracture, temporomandibular surgery, pathologic trauma, and psychosocial problems were excluded from the study. The patient was scheduled for physiotherapy 5

days per week for 7 weeks for 1 hour every session. After the intervention after 7 weeks, the effects were assessed using the same tools as the pre-test.

2.1 Physiotherapy Management

The patients underwent a 7-week SSE treatment program for 1 hour, five days per week. The short-term goals of the treatment were to reduce pain, improve posture, and enhance muscle activation. The long-term goals were to prevent recurrence and enhance quality of life. The SSE program included relaxation techniques, supine arm raises, quadruped arm lifts, and mat/bed exercises.

Table 1: SSE exercises and instructions

Exercise	Instructions
Relaxation	The patient should lie on their back (supine position) and take a deep breath to relax the body while ensuring the shoulders and neck are in a comfortable posture.
Supine Arm Raise	The patient bends their knees and places their feet flat on the floor, holding the posture without any neck movement. Then the patient raises their arms alternately to 90° shoulder flexion with full elbow extension and scapular protraction. This posture is held for 10 seconds before returning to the starting position. Three laps of 10 repetitions with a one-minute break in between were performed.
Quadruped Arm Lift	In the quadruped position, the patient lifts their arms alternately with shoulder abduction and 120° flexion. This posture is held for 10 seconds before returning to the starting position. Three laps of 10 repetitions with a 30-second break in between were performed.
Mat/Bed Exercises	The patient should lie face down (prone position) on a flat surface such as a mat or bed (as shown in the Figure 1, 2 and 3). To make the "I" shape, maintain shoulder flexion in 180° with thumbs up, keeping the elbows straight. To make "Y" shape, maintaining straight elbows abduct both shoulders to approximately 135°. Now to form "T" shape, with fully extended elbows abduct both shoulders to 90° and finally bend both elbows to 90° horizontally to make a 'W shape.' Each position is maintained for 3 seconds and repeated 10 times for 3 sets.



Fig 1: Subject performing the "I" exercise



Fig 2: Subject performing the "Y" exercise



Fig 3: Subject performing the "T" exercise

2.2 Outcome Measurers

2.2.1 Visual Analog Scale (VAS)

The Visual Analog Scale (VAS) is a widely used tool for assessing pain intensity in various clinical settings, including among people with neck pain. VAS is a simple and effective way to quantify pain, allowing patients to rate their pain on a continuum from "no pain" to "worsening pain imaginable".

The VAS consists of a 10 cm horizontal line, where one end represents "no pain" (0) and the other end represents "worst pain imaginable" (10). Patients mark a point on the line that corresponds to their perceived pain level. The distance from the "no pain" end to the mark made by the patient is measured in centimeters and represents the pain intensity score.

The visual analogue scale (VAS) was found to be a valid and reliable tool for pain assessment, as supported by Begam *et al.* (2019). Additionally, it is an interval scale. Therefore, in clinical practice, we can use this scale for pain measurement as an outcome measure tool [7].

2.2.2 Neck Disability Index (NDI)

The Neck Disability Index (NDI) is a commonly used questionnaire designed to measure neck-specific disability. It helps assess neck pain's impact on a patient's daily life and activities, providing insight into their functional status and quality of life.

The NDI consists of 10 items, each scored on a 6-point scale (0-5), with higher scores indicating greater disability:

- 0: No disability
- 5: Complete disability

The items cover various aspects of daily living, including pain intensity, personal care, lifting, reading, headaches, concentration, work, driving, sleeping, and recreation. The total possible score is 50, with higher scores indicating more severe disability. A study by Ian A. Young PT, DSc *et al.* (2017) demonstrated good reliability and validity for the neck

disability index compared to the numerical pain rating scale. This study concluded that the NDI exhibited excellent reliability (ICC = 0.88; [0.63 to 0.95]), while the NPRS

exhibited moderate reliability (ICC = 0.67; [0.27 to 0.84])^[8].

3. Results & Discussion

Table 2: Pre and Post Scales

Sr. No.	Age	Gender	Occupation	Treatment	VAS (PRE)	VAS (POST)	NDI (PRE)	NDI (POST)
1	48	Female	Housewife	Scapular Stabilization Exercise	7	3	28	23
2	49	Female	Housewife	Scapular Stabilization Exercise	7	4	35	30
3	53	Female	Housewife	Scapular Stabilization Exercise	6	4	20	17
4	20	Female	Student	Scapular Stabilization Exercise	3	0	25	20
5	23	Female	Student	Scapular Stabilization Exercise	8	5	33	26
6	23	Male	Student	Scapular Stabilization Exercise	7	3	27	20
7	48	Male	Shopkeeper	Scapular stabilization exercise	6	3	29	22
8	21	Male	Student	Scapular stabilization exercise	3	0	21	12
9	26	Female	Student	Scapular stabilization exercise	7	2	34	25
10	42	Male	Watchman	Scapular stabilization exercise	6	4	28	20

This study investigated the effectiveness of scapular stabilization exercises (SSE) in reducing neck pain and improving forward head posture. The findings demonstrated that SSE is beneficial for reducing neck pain and improving forward head posture.

Seven weeks of SSE exercises resulted in a marked reduction in neck pain and improvement in forward head posture (FHP). These exercises can enhance scapular muscle strength and endurance, improve scapular position and motion, correct postural alignment, reduce muscle imbalance and tension, and enhance functional movement patterns.

In this study, patients showed noticeable differences in neck pain and forward head posture (FHP). Jeong-Il Kang, PT, PhD *et al.* (2016) also found similar results, indicating that scapular stabilization exercises appear to improve posture by strengthening and activating specific muscle groups, including the neck muscles, lower trapezius, and serratus anterior. This activation likely reduces the strain on these muscles, preventing compensatory movements associated with forward head posture and leading to better neck alignment^[4].

The VAS scale, an interval scale, was used to assess neck pain. The use of the VAS scale was supported by a study conducted by Begam MR *et al.* (2019). Their study concluded that the VAS scale is a reliable and valid tool for assessing pain^[7].

The Neck Disability Index (NDI) is a commonly used questionnaire designed to measure neck-specific disability. It is used to assess both neck pain and forward head posture. A study by Ian A. Young PT, DSc *et al.* (2017) supported the use of the NDI, demonstrating its good reliability and validity compared to the numerical pain rating scale^[8].

This study highlights the effectiveness of SSE in reducing neck pain and improving forward head posture. The results demonstrated that all participants experienced significant improvements in both the Visual Analogue Scale (VAS) for pain and the Neck Disability Index (NDI), underscoring the potential of these exercises as a viable intervention for individuals suffering from neck pain and postural issues.

By focusing on strengthening and stabilizing the scapular muscles, the intervention likely contributed to better alignment and muscle support, reducing the strain on the neck and subsequently decreasing pain and disability.

One important aspect of this study is the comprehensive improvement observed across all participants, regardless of their age, gender, or occupation. This suggests that scapular stabilization exercises can be universally beneficial for a diverse population suffering from neck pain and forward head

posture. The consistent reduction in VAS and NDI scores highlights the robustness of the intervention.

3.1 Limitations

- The sample size was relatively small, consisting of only 10 participants.
- Larger studies are needed to confirm these findings and generalize the results to a broader population.
- Additionally, the study did not include a control group, which limits the ability to attribute improvements solely to the scapular stabilization exercises.

3.2 Scope of Study

- Further research can be conducted on a larger population, over varying durations, with different outcome measures, and using different exercise therapy interventions for individuals with neck pain and forward head posture.
- A comparative study can also be done comparing this intervention with other treatment options to find out which treatment protocol provides better results in the cases of fall risk after stroke in future studies study was conducted over a short period of seven weeks.

4. Conclusion

This study concluded that Scapular Stabilization Exercises can be effective for patients with neck pain and forward head posture.

5. Acknowledgement

We would like to thank the participants for their involvement and commitment to the study. We also acknowledge the support of our colleagues who assisted in data collection and analysis. This study received no specific grant from public, commercial, or not-for-profit funding agencies.

6. Conflict of Interest

The authors declare no conflicts of interest related to this study.

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