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Review Article

Physiotherapy Section

Effectiveness of Scapular Stabilisation Exercises in the Management of Forward Head Posture: A Narrative Review

MAITHRI SUDHIN[1], SAUMYA SRIVASTAVA[2]

ABSTRACT

Forward Head Posture (FHP) is a condition in which the head is positioned more anteriorly, resulting in an exaggerated anterior convexity of the cervical spine. It is associated with flexion of the lower cervical spine (C4-C7) and hyperextension of the upper cervical spine (C1-C3). FHP is linked to a range of consequences, including altered scapular mechanics, postural impairments, muscular imbalances, compromised respiratory function, impaired balance, and reduced cervical proprioception. Scapular Stabilisation Exercises (SSE), as a targeted therapeutic approach, can effectively address FHP by reducing pain and impairment, restoring normal muscle function, and improving cervical range of motion. The current narrative review aimed to assess the efficacy of SSE in the management of FHP and to augment the existing body of evidence supporting its clinical application. Based on the findings, the present review highlights SSE as a clinically effective intervention for individuals presenting with FHP.

Keywords: Levator scapulae, Neck pain, Physiotherapy, Posture

INTRODUCTION

Approximately 75% of people worldwide spend most of their time on high-tech gadgets, including laptops, smartphones, electronic readers, and video gaming consoles. Excessive use of such devices can lead to neck muscle spasms and uncomfortable postures [1]. FHP is one such postural deviation, typically involving flexion of the lower cervical spine (C4-C7) and hyperextension of the upper cervical spine (C1-C3) [2]. The growing use of electronic screens such as smartphones and personal computers, averaging about 8 hours per day, has resulted in a greater number of people developing FHP [3].

Studies indicate that up to 70% of physiotherapy students in India and 63.96% of university students in Pakistan demonstrate signs of FHP [4,5]. FHP has a significant impact on musculoskeletal health, resulting in overactivation of the upper trapezius, neck extensors, and sternocleidomastoid muscles. It also leads to inhibition of cervical flexors and scapular retractors [1]. Additionally, it is associated with shortening of the posterior neck extensors and increased tension in the anterior cervical and shoulder muscles. These changes can alter the position of the scapula and scapular kinematics, potentially leading to scapular dyskinesis [6].

Although evidence supports a link between persistent cervical postural abnormalities and shoulder pain, the precise role of cervical posture remains underexplored. A plausible biomechanical mechanism involves an imbalance in scapular upward rotators, which leads to abnormal scapular and humeral kinematics [6]. FHP is also associated with temporomandibular joint disturbances [7]. It may further cause respiratory dysfunction by reducing peak flow rate, forced expiratory volume in one second, expiratory and inspiratory volumes, forced vital capacity, and lower thoracic mobility [8]. Chronic FHP disrupts cervical proprioception, postural control, and vestibular performance [9]. A study by Lee JH has shown that FHP is also associated with reduced static balance control [10].

Research indicates that physiotherapy plays a crucial role in managing FHP through various interventions. These include Postural Correction Exercises (PCE), biofeedback, electrotherapeutic modalities such as ultrasound and infrared radiation, strengthening of the shoulder retractors and cervical flexors, and manual therapy [11]. Additionally, Pilates and McKenzie exercises have been found to be beneficial [3,12]. As individuals with FHP often experience issues with the muscles that connect the neck to the shoulders, improving thoracic spine mobility is crucial for proper head and neck posture. As a result, SSEs are a useful method for restoring muscle balance and correcting postural imbalances. SSEs help reposition the thoracic cage into a neutral position, restore neck alignment, and correct abnormal posture by adjusting scapular kinematics and position [1]. The main objective of the present research is to thoroughly examine existing literature and collect evidence regarding the effectiveness of SSEs in managing FHP.

Causes of FHP

FHP is often caused by multiple lifestyle and ergonomic factors. One significant contributor is prolonged use of computers and smartphones [13]. Research indicates that pain and fatigue worsen with longer smartphone use in individuals with FHP [14]. Additionally, sleeping with the head excessively elevated [13] and long periods of poor seated posture while reading, texting, or driving are frequently linked to FHP [15].

Consequences of FHP

FHP can lead to a cascade of anatomical and functional issues involving the cervical spine, scapular region, muscles, and even respiratory and vestibular function. The consequences of FHP are shown in [Table/Fig-1] [1,6-8,16-20].

Affected region/ system	Consequences
Scapular region	The levator scapulae length and tension during the scapular upward rotation can be altered in FHP. It is also associated with increased levator scapulae activity. The levator scapulae resist upward rotation while the trapezius aids in it. Thus, in FHP upper and lower trapezius must contract more to counter balance this. It is also believed that improper alignment of cervical spine can also alter the resting position of the scapula [6]. A study even revealed that individuals with FHP experience persistent neck pain and were more likely to develop scapular dyskinesis than the normal posture [16].
Postural adaptations	Elevation of the first and the second ribs, internal rotation of humeri, protraction, rotation and elevation with downward rotation of scapulae, reduction of lower and middle cervical lordosis and also modification of upper thoracic kyphosis [17].

Muscular system	FHP is linked with imbalance of suboccipitals, scalenus, scapular retractor muscles, cervical spine flexors, semispinalis capitis posterior major, levator scapulae, upper trapezius and sternocleidomastoid. Even at rest, adopting such a posture causes overactivation of upper and lower trapezius muscles as well as the neck extensors. FHP also causes inhibition of cervical flexors and mid scapular retractors and cervical extensor spasm. In order to support weight of head, the sternocleidomastoid over activates to overcome weak cervical extensor muscles. These compensatory movements occur in FHP [1].
Temporomandibular joint	Anatomically, FHP can alter the temporomandibular joint which could disrupt joint's ability to operate. According to a study the head of individuals with temporomandibular disorders was positioned further anteriorly than normal individuals [7].
Respiratory system	Decreased peak flow rate, forced expiratory volume at one second, expiratory and inspiratory reserve volumes, forced vital capacity and also the lower thoracic motion [8].
Cervical region	FHP has also been linked to reduced cervical ROM, mainly neck rotation and flexion [18]. Furthermore, it may also cause altered cervical proprioception [19] and cervicogenic headaches [20].
Balance	Reduced static balance control [20].

[Table/Fig-1]: Consequences of FHP [1,6-8,16-20]
FHP: Forward head posture; ROM: Range of motion

Treatment Techniques for the Management of FHP

Various treatment options are available to manage FHP. These include PCEs [1], strengthening of the shoulder retractors and deep cervical flexors, manual therapy to the cervical and thoracic spine, and electrotherapy modalities such as ultrasound and infrared radiation [11]. Other effective approaches include Pilates [3] and the McKenzie technique [12].

Scapular Stabilisation Exercises (SSE): The concept of stability refers to the ability of a system to return to its original position or movement path following a disturbance. Joint instability occurs when motion surpasses normal limits without adequate muscular control. Applying this to the scapulothoracic joint makes it challenging to define scapular stability objectively. Therefore, clinically, it is often described as smooth, coordinated scapular movement during arm motions [21].

The purpose of SSE is to restore scapular position, direction, muscle movement control, and movement patterns to achieve stabilisation [22]. The scapula is crucial for promoting optimal shoulder function, where biomechanics and scapular anatomy work together to create effective shoulder mobility. Normal scapular mechanics and posture may be altered when there is scapular muscle weakness or dysfunction [23]. Improving thoracic spine mobility is essential to maintain proper head and neck posture, as individuals with FHP commonly experience problems with the muscles that connect the neck to the shoulders. SSEs are therefore a helpful method for restoring postural and muscular imbalances [1].

Types of SSE: Many studies have incorporated various types of SSE, including serratus anterior punches, scapular depression exercises, scapular protraction and retraction using resistance bands, and dynamic arm movements forming I, Y, T, and W shapes while positioning a gym ball between the chest and abdomen [24-26]. Kang NY et al., and El-Sadany SM et al., used an SSE protocol consisting of four exercises performed in a kneeling position with a Swiss ball between the chest and abdomen to ensure alignment. The following exercises were performed:

- Scapular retraction: Raising both arms backwards and retracting the scapulae
- Scapular mobilisation: Raising both arms sideways with thumbs up
- Dynamic stabilisation 1: Raising one arm beside the ear while pushing the other arm behind the back
- Dynamic stabilisation 2: Raising both arms beside the ears, then lowering them with elbows bent at 90 degrees, and repeating the action [27,28].

The SSE protocol implemented by Im B et al., [29] and subsequently by Abd El-Azeim AS et al., involved five stages: supine breathing and shoulder relaxation, dominant arm raises with scapular protraction, alternating arm raises in quadruped, dumbbell side raises in a seated position, and mirror correction of posture and incorporated progressions such as T-Y-W patterns on a Swiss ball, scapular protraction push-ups, and scapular clock drills. These exercises were effective in improving serratus anterior and upper trapezius muscle activation, as well as postural control in individuals with FHP [1].

Impact of SSE on FHP: SSEs, designed to strengthen and restore normal muscle function, have been shown to reduce pain and improve posture in individuals with FHP and neck discomfort. When practiced consistently, especially in combination with Cervical Stabilisation Exercises (CSE), the benefits are even more pronounced. Individuals with chronic neck pain often experience notable improvements when SSE is combined with relaxation techniques. These improvements include increased cervical range of motion and decreased pain and impairment. SSEs have been shown to enhance activation of the serratus anterior and lower trapezius muscles while reducing compensatory overactivity of the upper trapezius, resulting in improved muscular balance and postural correction [28].

REVIEW OF LITERATURE

The present review examines the effectiveness of SSE in the management of FHP through a thorough analysis of multiple studies, as shown in [Table/Fig-2] [1,24-28]. The combined findings from the reviewed trials provide insight into the potential advantages of SSE as a treatment approach for enhancing posture, reducing pain, decreasing disability, and addressing additional FHP symptoms.

Author, year (study design)	Number of participants (n)	Mean age/ Average age	Interventions	Conclusion	PEDro score
El-Sadany SM et al., 2024 (Randomised controlled trial) [28]	n=60	30-40 years	Group A: Traditional exercises Group B: Received traditional exercises and SSE Group C: Received traditional exercises and HILT	All the groups exhibited significant improvement in the FVC, FEV1, FEV1/FVC, MVV, CVA, VAS, NDI and chest expansion ($p<0.001$). However, Group B showed improvements in FVC, FEV1, MVV, CVA and chest expansion compared to other groups ($p<0.05$). Group B exhibited lower VAS and NDI than other groups ($p>0.05$). While HILT is superior for reducing pain and improving NDI scores, SSE is more effective for improving chest expansion, ventilatory functions and neck alignment.	6/10
Buttagat V et al., 2023 (Randomised controlled trial) [25]	n=48	CTSC group: 24.83 years Control group: 24.67 years	CTSC group: Traditional Thai massage, SSE and chest mobilisation. Control group: Resting on the bed.	Participants in the CTSC group exhibited significant improvement in their cervical flexion and forward head angle ($p<0.05$) at week 4 and week 8. However, there was no significant between group differences in FVC at week 4 and week 8. Therefore, 4 weeks of CTSC demonstrated to decrease FHA and increase cervical flexion range of motion in individuals with FHP.	7/10

Abd El-Azeim AS et al., 2022 (Randomised controlled trial) [1]	n=60	20 to 35 years	Group A: Received SSE and PCE. Group B: Received PCEs.	Both the groups showed statistically significant improvements in CVA, PPT, cervical flexion and extension endurance (p<0.05) with the experimental Group Benefitting more. Additionally, both the groups exhibited significant reductions in the RMS values of upper trapezius and sternocleidomastoid muscles at rest and activity (p<0.05), again favoring the experimental group, except for the left sternocleidomastoid at rest. Therefore, adding SSE would seem to be more effective in improving CVA, PPT, muscle activity and disability than PCE alone.	7/10
Kang NY et al., 2021, (Randomised controlled trial) [27]	n=32	Mean age: 36.63 years Range: 23-57 years	Experimental group: Received SSE and TEE. Control group: Received CSE and SE.	In comparisons within the groups, both the groups exhibited significant improvements in CVA, FEV1, VAS and NDI after the intervention (p<0.05). The experimental group showed a significant improvement in maximum inspiratory pressure, maximum expiratory pressure and forced vital capacity. Between group comparisons showed significant difference (p<0.05) in FEV1 and VAS outcomes. The study concluded that a combination of SSE and TEE is effective in improving posture, respiration, neck pain and disability in office workers with FHP.	6/10
Shiravi S et al., 2019 (Randomised controlled trial) [24]	n=135	27.23±1.9 years	Group 1: Received SSE with ACF. Group 2: Received SSE only. Group 3: Served as a control group receiving active self-exercise.	Group 1 exhibited significant improvements in pain, proprioception, strength and electromyography than the other groups. However, within group analysis revealed significant changes in posture, pain, proprioception, strength and electromyography in both Group 1 and 2. Despite these improvements, muscle strength did not exhibit significant improvements overall. The study concludes that a combination of SSE with ACF has a more significant effect on all variables than SSE alone.	7/10
Kang JI et al., 2018 (Randomised controlled trial) [26]	n=30	25 to 50 years	Experimental Group 1: Received SSE. Experimental Group 2: Received neck stabilisation exercise.	All the groups showed significant changes in craniovertebral angle and craniorotational angle, with greater CVA improvement in Group 1. Muscle activation also changed significantly with Group 1 showing greater increases in lower trapezius and serratus anterior. This study concludes that SSE is a more successful intervention strategy for individuals with FHP in terms of neck alignment and changes in muscle activity.	7/10

[Table/Fig-2]: Summary of studies determining the effectiveness of SSE in the management of FHP [1,24-28].
PEDro: Physiotherapy Evidence Database; SSE: Scapular stabilisation exercises; HILT: High intensity laser therapy; FVC: Forced vital capacity; FEV1: Forced vital capacity at 1 second; MVV: Maximum voluntary ventilation; CVA: Craniovertebral angle; VAS: Visual analogue scale; NDI: Neck disability index; CTSC: Combination therapy of traditional Thai massage, scapular stabilisation exercise, and chest mobilisation; FHA: Forward head angle; PCE: Postural correction exercises; PPT: Pain pressure threshold; RMS: Root mean square; TEE: Thoracic extension exercises; CSE: Cervical stabilisation exercises; SE: Stretching exercises; ACF: Abdominal control feedback.

DISCUSSION

The present study sought to gather recent literature on the role of SSEs in FHP in order to develop a better understanding of this therapeutic approach. Findings from the reviewed literature underscore the effectiveness of SSE both as a standalone intervention and in combination with other therapeutic modalities. For instance, Kang JI et al., observed a positive effect of SSE alone compared to neck stabilisation exercises in improving neck alignment and muscle activity, suggesting that targeting the scapular region may yield more direct biomechanical benefits for cervical posture correction [26].

Abd El-Azeim AS et al., further highlighted the superior role of SSE when added to PCEs in improving the craniovertebral angle, muscle activity, and disability. They also emphasised the need for future studies to include objective assessments of key scapular muscles such as the serratus anterior and lower trapezius, as these muscles play a major role in scapular kinematics [1].

Similarly, El-Sadany SM et al., revealed that SSE is a better option than HILT for improving chest expansion, ventilatory function, and neck alignment in individuals with FHP. They proposed that HILT may serve as a complementary modality, particularly in cases where pain limits active participation in exercise [28].

On the other hand, combining SSE with other interventions such as thoracic extension exercises and ACF has shown significant improvements in multiple outcome measures in individuals with FHP [24,27]. When Kang NY et al., combined SSE with thoracic extension exercises, they observed improvements in postural control, respiratory function, and cervical and thoracic alignment. According to their findings, improving thoracic mobility has an indirect positive impact on respiratory mechanics and cervical posture, particularly in sedentary groups such as office workers [27].

Shiravi S et al., emphasised that the addition of ACF to SSE yielded greater improvements in neck pain, the flexion-relaxation phenomenon, and muscle strength. Their investigation highlighted the importance of core stability in optimising activation patterns of the scapular and cervical muscles [24]. Moreover, in a multimodal approach such as CTSC (Cervical stabilisation, Traditional Thai massage, SSE, and Chest mobilisation) examined by Buttagat V et al., significant improvements in cervical flexion ROM and a decrease in forward head angle were reported. They interpreted the intervention as a promising alternative for the management of FHP, particularly for addressing musculoskeletal and postural impairments through combined manual and exercise-based therapies [25].

These interpretations collectively suggest that SSE not only corrects the muscular imbalances underlying FHP but also enhances the effectiveness of other treatments by providing a biomechanical basis for long-term postural correction. Both as a direct and adjunctive therapy, SSE is justified by improvements in alignment, muscle activation, and functional outcomes in a variety of treatment protocols. Collectively, the evidence suggests that SSE is effective not only as a standalone intervention, but also as a valuable adjunct when incorporated into a multimodal rehabilitation strategy.

Even though SSE has been found to be effective in addressing FHP, several common limitations were noted in the studies reviewed. Firstly, most follow-up periods were short, offering limited insight into the long-term effects of the interventions. Furthermore, the overall duration of treatment was short, which may be insufficient for observing sustained improvements. The sample sizes were small, affecting the generalisability of the results. Additionally, the studies primarily focused on a limited age range, restricting applicability to a wider population.

Future research should aim to address these limitations by incorporating larger and more diverse sample populations, including specific subgroups such as office workers, students, and older adults who are more prone to FHP due to lifestyle or age-related factors. To evaluate the durability of improvements achieved through SSE, longitudinal research with extended follow-up periods is essential. Moreover, future investigations should explore the synergistic effects of SSE with other therapeutic modalities to determine the most effective multimodal strategies for managing FHP.

CONCLUSION(S)

The present study concludes that SSEs play a crucial role in the management of FHP. They are effective both as an independent modality and when integrated with other therapeutic interventions. SSEs are beneficial for improving posture, ventilatory function, chest expansion, and for reducing pain and disability. Furthermore, they contribute to better muscle activation. Therefore, incorporating SSE into rehabilitation programmes can significantly benefit individuals with FHP. Clinicians can implement these exercises as an important component of treatment, tailoring them to each patient's needs and combining them with complementary therapies. Considering the promising findings, future research should focus on larger and more diverse sample sizes, longer-term follow-up, and comparisons of SSE with other interventions to fully understand their long-term effects and optimal clinical application.

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PARTICULARS OF CONTRIBUTORS:
1. Student, Nitte (Deemed to be University), Nitte Institute of Physiotherapy (NIPT), Mangalore, Karnataka, India.
2. Associate Professor, Nitte (Deemed to be University), Nitte Institute of Physiotherapy (NIPT), Mangalore, Karnataka, India.

NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:
Saumya Srivastava,
Nitte (Deemed to be University), Nitte Institute of Physiotherapy (NIPT),
Mangalore, Karnataka, India.
E-mail: saumyasri2000@nitte.edu.in

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