

Efficacy of Elongation Longitudinaux Avec Decoaption Osteo Articulaire versus McKenzie Exercises for Forward Head Posture in Excessive Smartphone Users Among University Students

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ABSTRACT

Background - Forward Head Posture (FHP) is a result of poor postural habits linked to excessive smartphone use, which is becoming more prevalent among college students. For postural correction, physiotherapy techniques like McKenzie exercises and Elongation Longitudinaux Avec Décoaptation Ostère-Articulaire (ELDOA) are frequently employed. McKenzie exercises emphasize self-correction and repeated movements, whereas ELDOA concentrates on spinal decompression and fascial stretching. There is, however, little comparative data regarding their efficacy in treating FHP.

Aims of the study - To Compare efficacy of ELDOA vs McKenzie exercises for forward head posture.

Procedure- Ethical clearance was obtained from Institution Ethical Committee. 70 university students, ages 18 to 30, who have been diagnosed with forward head posture and excessive smartphone use (more than four hours per day) will participate in a randomised controlled trial. There will be 35 participants in each of the two groups, Group A (ELDOA) and Group B (McKenzie exercises), which will be assigned at random. For four weeks, both groups will receive traditional physical therapy in addition to intervention three times a week. CVA, NDI, NPRS will be used as outcome measures. Values before and after the intervention will be noted and examined.

Outcome measures- Craniovertebral Angle, Neck Disability Index, Numerical Pain Rating Scale.

Result- After four weeks, both groups' pain, disability, and craniovertebral angle significantly improved. Group A (ELDOA) saw improvements in CVA from 45.2° to 48.8°, NDI from 41.54 to 28.54, and mean NPRS (rest) from 4.28 to 1.28. The mean NPRS (rest) dropped from 4.11 to 0.57, the NDI dropped from 39.91 to 23.08, and the CVA improved from 45.77° to 51.17° in Group B (McKenzie exercises). In contrast to Group A, Group B showed more improvement in postural correction, functional disability, and pain reduction.

Conclusion- Both ELDOA and McKenzie exercises are effective for managing forward head posture, but McKenzie exercises are more effective in improving posture, reducing pain, and decreasing disability.

Keywords - Forward Head Posture, ELDOA, McKenzie Exercises, Smartphone Users, CVA, NDI, NPRS

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INTRODUCTION

Forward Head Posture

Excessive smartphone use has become a common aspect of modern life, particularly among younger population. According to Chen et al. (2024), smartphone usage is increasing globally, with an average of 2.4 hours and some users exceeding 5 hours per day¹. Prolonged screen time often leads to poor posture, placing undue stress on the neck and shoulders. Musculoskeletal issues are the most prevalent of these concerns.¹⁴ In this regard, the World Health Organisation defines musculoskeletal disorders associated to the workplace as "injuries in muscles, tendons, peripheral nerves, and vascular vessels, possibly caused by, precedent to, or worsened by repetitive or continuous use of a certain body part."¹⁴

With the rising use of VDTs (visual display terminal) in the leaning forward position, especially with the rise in popularity of smartphones, the turtle neck posture is becoming more prevalent.¹⁴ One of the most prevalent musculoskeletal issues associated with smartphone use is Forward Head Posture (FHP). Since smartphone usually have small screens that are often held down near the lap, users tend to bend their heads forward to view them, which can contribute to the development of FHP¹.

The cranium should not be tilted, retracted, twisted, or extended in order to achieve ideal head position.¹⁵ This is preferred because it reduces the amount of muscle force required to oppose the head's propensity to tilt forward, a condition known as forward head posture (FHP).¹⁵

FHP is characterised by hyperextension of upper cervical spine (C1-C2) and flexion of lower spine (C3-C7)². It involves an increased anterior cervical curve, leading to weakness in the deep cervical flexors, mid-thoracic rhomboids, and mid and lower trapezius muscles, while causing shortening of the neck extensors¹. The middle trapezius, splenius, and sternocleidomastoid muscles' EMG activity were reduced by FHP; these decreased activities were linked to a diminished capacity to produce force and were caused by changes in muscle length.¹⁶

One of the main anatomical characteristics of FHP is muscle imbalance. The deep cervical flexor muscles, especially the longus colli and longus capitis, which are crucial for preserving cervical stability, have decreased activation and endurance.²¹ Concurrently, superficial muscles like the anterior scalene and sternocleidomastoid tend to become overactive, which can lead to poor postural control and altered movement patterns.¹⁹

Furthermore, tightness is frequently seen in the levator scapulae, upper trapezius, and suboccipital muscles, which increases compressive forces on the cervical spine and limits normal movement.²⁰ The normal scapulothoracic rhythm is further disturbed by weak scapular stabilising muscles, which has an indirect impact on cervical posture.²⁰

Hence, the cervical spine typically exhibits a lordotic appearance³. According to Griegel-Morris et al. (2012), a forward head posture may impact not just the neck but also the thoracic spine and shoulder blade, potentially leading to a musculoskeletal system imbalance.¹⁴ FHP increases neck strain 3.6 times, leading to postural misalignment, muscle weakness, and decreased cervical spine range of motion³.

Burgess-Limerick et al.¹⁰ suggested that such posture causes shortening of muscular fibers around articulation atlantooccipitalis and overstretching of muscles around joints and thus possibly chronic neck pain.¹⁴

According to Panzer et al., improper biofeedback—the process of preserving bodily balance—was caused by neck trauma or vestibular dysfunction.¹⁴ It may also alter the torque needed to maintain posture, which is linked to a decreased capacity to control balance.¹⁴ Persistent spinal abnormalities eventually result from an increased strain on the spinal tissues.¹⁶

Furthermore, Forward Head Posture lowers the cervical spine's sense of proprioception.¹⁶ It is possible that FHP could have an impact on the center of gravity and cause an imbalance when standing.¹⁵

Physiotherapy plays a crucial role in managing FHP through targeted exercises interventions aimed at restoring postural alignment, reducing pain, and improving muscle function. Two prominent exercise-based approaches for postural correction includes

Elongation Longitudinaux Avec Decoaption Osteo Articulaire (ELDOA) technique and McKenzie exercises.

Elongation Longitudinaux Avec Decoaption Osteo Articulaire (ELDOA) technique

ELDOA is a French acronym that is translated to English as LOADS (Longitudinal osteo-articular decertation stretches)¹⁰. ELDOA technique were designed by Guy Voyer, which gradually but quickly improves the postures that our bodies have acquired due to sedentary lifestyles¹⁰.

Guy Voyer created the exercise-based method known as Elongation Longitudinaux Avec Décoaptation Ostère-Articulaire (ELDOA), which uses active muscle engagement and precise postural positioning to target specific spinal segments.²² Its purpose is to reduce compressive forces on facet joints and intervertebral discs by creating a longitudinal stretch along the spine.²² ELDOA, is an active decompression method that targets specific joints by applying tension to fascia chains through body's own muscle contraction, thereby reducing pain². It is an active traction exercise that creates tension in the body's fascia to space the joints.¹⁰

Therefore, it would be described as a postural self-normalizing technique designed to expand the area inside a chosen articulation.¹⁰ ELDOA often occurs at multiple levels of the spine but can also target specific levels where the subject is instructed to concentrate on their breathing pattern in order to attain better results and promote mental calm.¹⁰ ELDOA also includes postural awareness and breathing control, which improve neuromuscular coordination and encourage the relaxation of overactive muscles. Both static and dynamic posture can be improved with this integrated approach.²

ELDOA technique entails specific postural holds that facilitate spinal segment decompression, promote intervertebral disc fluid absorption, and improve proprioception and respiratory function within the affected spinal region⁴. Because the decompressive effect is thought to promote fluid exchange and nutrient diffusion within the discs, which is crucial for preserving disc health and averting degeneration, ELDOA also has a significant impact on intervertebral disc physiology.²²

Additionally, it has been proposed that ELDOA has a beneficial effect on the autonomic nervous system, specifically by lowering sympathetic overactivity linked to chronic pain conditions, which helps to improve function and relieve pain.⁴

It enhances local proprioception of the targeted segment, leading to improved orientation perception and the ability of self-correct postural discrepancies, ultimately increasing awareness to correct abnormal posture². This technique, based on several therapeutic

philosophies, attempts to improve posture and reduce pain, making it effective in managing FHP and other musculoskeletal issues⁴.

McKenzie technique

The McKenzie method, also known as Mechanical Diagnosis and Therapy (MDT), is a widely accepted method that focuses on evaluating, categorizing, and treating spinal disorders based on how the patient reacts to repeated movements.²³ It helps choose the best course of treatment by categorizing patients into syndromes like postural, dysfunctional, and derangement.²³

McKenzie technique is one of the most popular treatments for spinal disorders, including dysfunctions like FHP, is the McKenzie technique, which involves postural correction and a suitable repeated loading strategy that is advanced based on the patient's response¹⁸. The idea of directional preference, which states that certain movements—typically extension in cervical spine conditions—produce a reduction or centralization of symptoms, is a key component of McKenzie exercises.²⁴ Treatment is customized based on the patient's mechanical response thanks to this individualized approach.²⁴

The McKenzie exercise is a self-therapeutic, repetitive exercise that focuses on extension⁵. The program is designed to improve neck posture and increase return-to-work rates⁵. Youn and Sung found that the McKenzie exercise significantly enhance head and shoulder posture in patients with persistent neck pain⁶. The cervical flexors, or deep cervical flexors, and the cervical extensors, or suboccipitals, are the main cervical muscles that experience imbalance.¹⁸

According to published research, deep cervical flexor strengthening and sub-occipital stretching are essential for correcting posture and maintaining it to avoid recurrence.¹⁸ Furthermore, individuals with neck pain who performed McKenzie exercises reported reduced pain, greater function, and positional shift⁶.

By applying repeated loading, McKenzie exercises also aid in the remodeling of soft tissues by gradually increasing tissue extensibility and decreasing stiffness.²³ Cervical mobility is improved and normal joint mechanics are restored as a result.²³ The McKenzie method focuses on self-directed spinal movements and postural correction to alleviate pain and restore spinal alignment.

Adolescents with forward head posture can benefit from McKenzie exercises, which are suitable interventions to increase the craniovertebral angle.¹⁷ McKenzie exercises are focused, repetitive, self-therapeutic exercises.¹⁷

Additionally, it can help patients function better and lessen the stress and discomfort associated with recurrence.¹⁷ This strategy's contribution to prevention and self-management is another benefit.²⁴ By learning

about ergonomics and posture correction, patients are better equipped to control their symptoms on their own and prevent recurrence.²⁴

Additionally, because McKenzie exercises incorporate movement correction into regular activities, they have been demonstrated to enhance functional capacity and daily activity performance, making the intervention feasible and long-lasting.⁶ As a result, it can assist correct forward head posture and enhance neck alignment.¹⁷

MATERIALS AND METHODOLOGY

An Experimental Interventional study done using Simple random sampling method at D. Y. Patil University on Excessive smartphone users. The study was conducted for a duration of 6 months (3 times per week for 4 weeks). The sample size was 70. The study subjects were selected according to the inclusion and exclusion criteria.

Materials

Physio-Master Postural Assessment App, Numerical Pain Rating Scale, Assessment form, Data collection sheet, Consent Form.

Inclusion Criteria: Age group: Participants aged 18–30 years (college-going population), Excessive smartphone use: Individuals using smartphones for more than 4 hours per day for at least 6 months, Forward Head Posture (FHP): Diagnosed FHP based on clinical assessment and photographic or radiographic evidence (e.g., craniovertebral angle < 50 degrees), No participation in other posture correction or physiotherapy programs during the study period.

Exclusion Criteria:

History of cervical spine surgery, trauma, or fracture, Presence of neurological disorders affecting posture or balance (e.g., Parkinson's, multiple sclerosis), Congenital spinal deformities or scoliosis, any systemic musculoskeletal conditions like rheumatoid arthritis or ankylosing spondylitis, Use of posture-correcting devices or braces, Participants unable to commit to the full intervention duration or follow-up.**RESULT**

The comparative study of ELDOA and McKenzie Exercise revealed that CVA, NDI and NPRS improved more significantly in the McKenzie Exercise group than the ELDOA exercise group.

GENDER DISTRIBUTION

Table 1 presents the gender distribution of the total participants. Among the 70 participants, 24 were male and 46 were female.

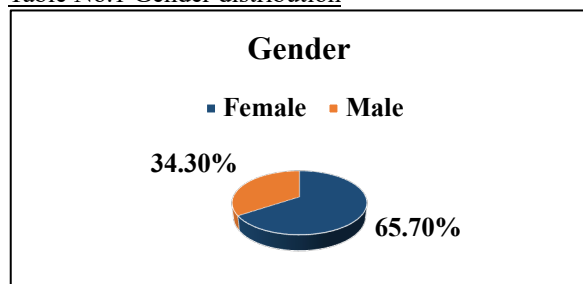
Graph 1 illustrates the percentage distribution, showing that males are accounted for 34.30% of the total, while females comprised 65.70%.

GENDER DISTRIBUTION

Efficacy of Elongation Longitudinaux Avec Decoaption Osteo Articulaire versus McKenzie Exercises for Forward Head Posture in Excessive Smartphone Users Among University Students

Gender	Frequency	Percentage
Male	24	34.30%
Female	46	65.70%
Total	70	100.00%

Table No.1 Gender distribution



Graph No.1 Gender distribution

A. AGE WISE DISTRIBUTION

Table 2 The study comprised a broad adult population, as seen by the age distribution of the participants, which shows that the minimum age was 19 and the maximum age was 28. The participants' average age was 23.36 years, indicating that the majority fell into the middle age range. The individuals' ages were fairly distributed around the mean without significant fluctuation, as indicated by the standard deviation of 1.72, which denotes moderate age variability. With a general tendency toward middle age, the sample as a whole reflects a reasonably broad adult age range.

	Minimu m	Maximu m	Mea n	Std. Deviation
Age	19	28	22.36	1.72

Table No. 2 Age Distribution

B. PRE & POST NPRS, NDI and CVA IN GROUP A

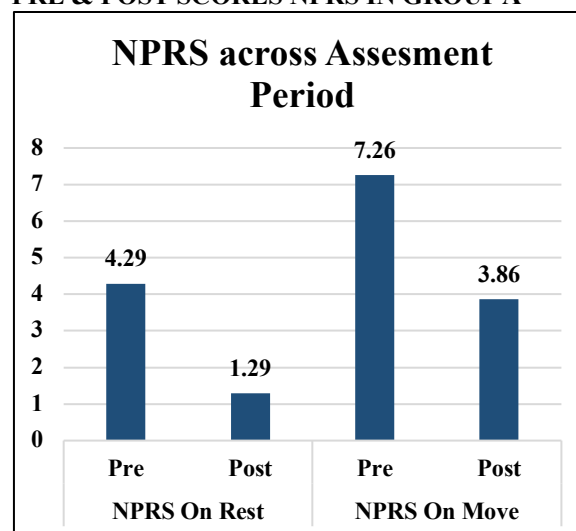
Paramete r	Assessmen t Period	Me an	Std. Deviation	p- valu e
NPRS On Rest	Pre	4.29	0.86	<0.001*

	Post	1.29	1.017	
NPRS On Move	Pre	7.26	0.852	<0.001*
	Post	3.86	1.192	
NDI	Pre	41.54	3.853	<0.001*
	Post	28.54	3.128	
CVA	Pre	45.2	1.659	<0.001*
	Post	48.8	1.451	

Table No. 3 Pre-Post Intervention of NPRA, NDI and CVA in Group A

The results of Group A indicate that ELDOA exercises produced noticeable improvements in posture, pain, and functional ability.

C. PRE & POST SCORES NPRS IN GROUP A



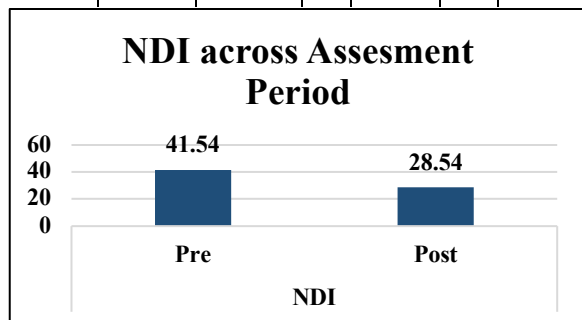
Graph No. 2 Pre-Post Intervention of NPRS in Group A

The Numeric Pain Rating Scale (NPRS) reduced from 4.28 (pre) to 1.28 (post), showing a decrease of 3 points. This indicates a **significant reduction in pain intensity**, likely due to reduced strain on cervical muscles and improved posture.

PRE-POST INTERVENTION OF NDI IN GROUP A

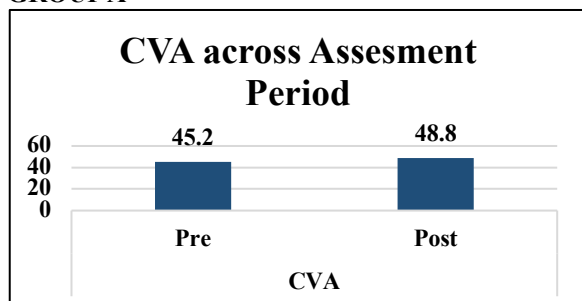
Efficacy of Elongation Longitudinaux Avec Decoaption Osteo Articulaire versus McKenzie Exercises for Forward Head Posture in Excessive Smartphone Users Among University Students

Parameter	Assesment Period	Mean	Std. Deviation	p-value
NPRS On Rest	Pre	4.11	0.796	<0.001*
	Post	0.57	0.608	
NPRS On Move	Pre	6.97	0.923	<0.001*
	Post	2.23	0.69	
NDI	Pre	39.91	4.546	<0.001*
	Post	23.09	2.605	
CVA	Pre	45.77	1.848	<0.001*
	Post	51.17	1.671	



Graph No. 3 Pre-Post Intervention of NDI in Group A
The **Neck Disability Index (NDI)** decreased from **41.54 (pre)** to **28.54 (post)**, with a reduction of **13 points**. This suggests that participants experienced a **noticeable improvement in their ability to perform daily activities**, such as sitting, reading, and working, with less discomfort.

D. PRE-POST INTERVENTION OF CVA IN GROUP A



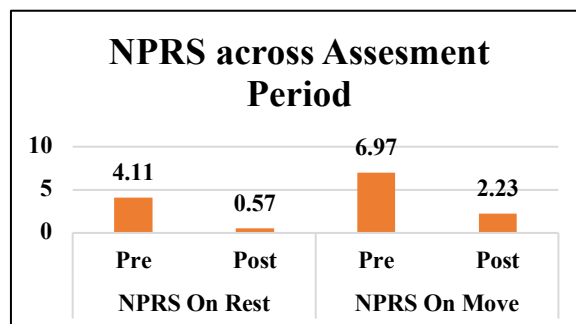
Graph No. 4 Pre-Post intervention of CVA in Group A
The **Craniovertebral Angle (CVA)** increased from **45.2° (pre)** to **48.8° (post)**, showing an improvement of **3.6°**. This increase indicates that the forward head posture was corrected to some extent, as a higher CVA reflects better alignment of the head over the cervical spine

E. PRE & POST NPRS, NDI and CVA IN GROUP B

Table No. 4 Pre-Post Intervention of NPRS, NDI and CVA in Group B

The results of Group B indicate that McKenzie exercises resulted in greater improvements compared to ELDOA.

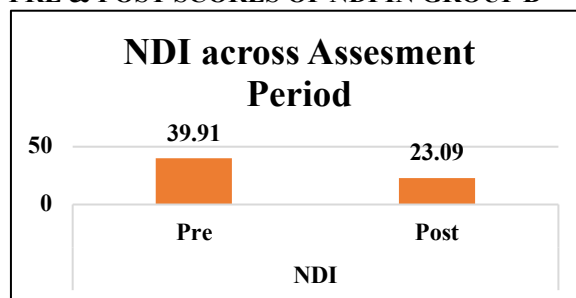
F. PRE & POST SCORES OF BORG SCALE IN GROUP B



Graph No. 5 Pre-Post intervention of NPRS in Group B

The **Numeric Pain Rating Scale (NPRS)** reduced from **4.11 (pre)** to **0.57 (post)**, indicating a decrease of **3.54 points**. This shows a **greater reduction in pain intensity**, suggesting that McKenzie exercises are highly effective in relieving cervical discomfort.

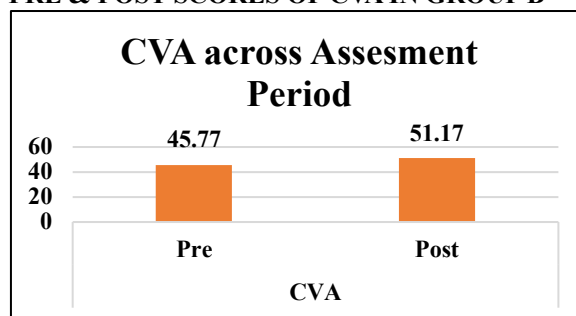
G. PRE & POST SCORES OF NDI IN GROUP B



Graph No. 6 Pre-Post intervention of NDI in Group B

The **Neck Disability Index (NDI)** decreased from **39.91 (pre)** to **23.08 (post)**, showing a reduction of **16.83 points**. This reflects a **substantial improvement in functional ability**, allowing participants to perform daily tasks with minimal difficulty.

H. PRE & POST SCORES OF CVA IN GROUP B



Graph No. 7 Pre-Post intervention of CVA I in Group B

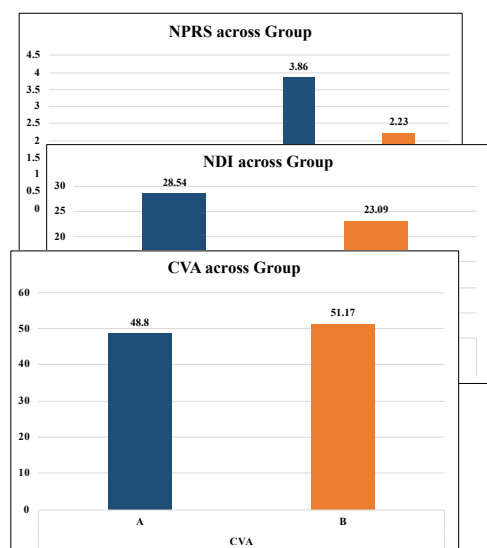
The **Craniovertebral Angle (CVA)** increased from **45.77° (pre)** to **51.17° (post)**, with an improvement of **5.4°**. This larger increase compared to Group A indicates a **more effective correction of forward head posture**, likely due to the emphasis on repeated cervical extension movements.

I. GROUP COMPARISON

Efficacy of Elongation Longitudinaux Avec Decoaption Osteo Articulaire versus McKenzie Exercises for Forward Head Posture in Excessive Smartphone Users Among University Students

Parameter	Group	Mean	Std. Deviation	p-value
NPRS On Rest	A	1.29	1.017	<0.001*
	B	0.57	0.608	
NPRS On Move	A	3.86	1.192	<0.001*
	B	2.23	0.69	
NDI	A	28.54	3.128	<0.001*
	B	23.09	2.605	
CVA	A	48.8	1.451	<0.001*
	B	51.17	1.671	

Table No. 5. GROUP COMPARISON



Upon comparing the two groups, it becomes clear that McKenzie exercises outperformed ELDOA in all assessed outcome measures.

The increase in craniovertebral angle (CVA) was 3.6° for Group A, while Group B saw an improvement of 5.4° , suggesting that Group B achieved a better correction of posture.

The Neck Disability Index (NDI) decreased by 13 points in Group A, whereas Group B experienced a reduction of 16.83 points, indicating that the McKenzie group had a greater functional improvement.

The Numeric Pain Rating Scale (NPRS) reflected a pain reduction of 3 points in Group A and 3.54 points in Group B, implying that pain relief was more significant in Group B.

Therefore, while both treatments were effective, McKenzie exercises showed enhanced effectiveness in terms of posture improvement, pain reduction, and functional enhancement.

DISCUSSION

The current study aimed to assess and compare the efficacy of McKenzie exercises and Elongation Longitudinaux Avec Decoaption Osteo Articulaire (ELDOA) in enhancing Forward Head Posture (FHP) among excessive smartphone users. The results of this study showed that both interventions were successful in improving functional disability, lowering pain, and correcting postural alignment. However, the

McKenzie exercise group outperformed the ELDOA group in terms of improvement.

The correction of muscular imbalance and improvement of cervical spine biomechanics are responsible for the improvement seen in both groups. FHP is linked to tightness in the superficial muscles and weakness in the deep cervical flexors, which results in altered posture and increased mechanical stress.²¹ Through focused interventions, both McKenzie exercises and ELDOA seek to correct this imbalance, improving cervical alignment and lessening symptoms.

In order to increase intervertebral space, improve circulation, and improve proprioception, the ELDOA technique uses segmental spinal decompression and active fascial stretching. Better alignment and postural awareness result from this. The results of Khalid et al. (2022), who reported notable improvements in posture, pain, and cervical mobility following ELDOA intervention, are in line with the improvement in craniovertebral angle and decrease in pain in the ELDOA group in this study. Additionally, segmental stabilization and neuromuscular control are encouraged by ELDOA, which may help with long-term postural correction.

McKenzie exercises, on the other hand, emphasize cervical extension and are based on repeated motions and directional preference. These exercises aid in the restoration of normal spinal alignment, the reduction of mechanical stress, and the centralization of symptoms. The McKenzie group's emphasis on frequent repetition, active patient involvement, and self-correction techniques may have contributed to the group's greater improvement. This improves postural awareness and motor learning. Kim et al. (2019) reported similar results, showing that McKenzie exercises significantly improved respiratory function and craniovertebral angle. Furthermore, McKenzie exercises greatly enhanced pain and functional outcomes in people with FHP, according to Gohil et al. (2024).

Deepak and Sharma (2024), who compared McKenzie exercises with scapular stabilisation exercises and found that McKenzie exercises were more effective in improving forward head posture and reducing neck disability among smartphone users, corroborate the results of this study. McKenzie exercises' superior efficacy in the current study may also be explained by their ease of use, simplicity, and viability for home-based practice, which enhances patient adherence.

The fact that both interventions were used in conjunction with traditional physiotherapy is another crucial factor that may have helped both groups' overall improvement. The McKenzie group's additional advantages, however, demonstrate its

efficacy as the main intervention for FHP management.

Despite the positive findings, a number of variables, including individual differences, the amount of time spent using a smartphone, and following an exercise regimen, might have affected the results.

CONCLUSION

The current study concludes that McKenzie exercises and Elongation Longitudinaux Avec Decoaption Osteo Articulaire (ELDOA) are both useful interventions for enhancing forward head posture, lowering pain, and reducing functional disability among excessive smartphone users. After the intervention period, both groups showed significant improvements in the Neck Disability Index (NDI), Numerical Pain Rating Scale (NPRS), and craniovertebral angle.

But when the two methods were compared, McKenzie exercises proved to be more successful in enhancing functional ability, lowering pain intensity, and improving postural alignment. The principles of repeated movements, directional preference, and active patient involvement, which promote improved neuromuscular control, postural awareness, and long-term self-management, may be responsible for this better result.

However, ELDOA's value as a supportive intervention in postural correction was also demonstrated by its ability to improve spinal alignment and alleviate symptoms through fascial stretching and segmental decompression.

Given their simplicity, ease of use, and suitability for home-based programs, McKenzie exercises can be viewed from a clinical standpoint as a more practical and effective primary intervention for managing forward head posture in excessive smartphone users. To achieve the best results, however, both approaches may be combined or chosen in accordance with clinical presentation, therapeutic objectives, and patient assessment.

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