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Comparison Between Effect of McKenzie Exercise and Postural Correction on Forward Head Posture Among Older Population

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Abstract

Introduction: Work-related neck and shoulder disorders (WRNSDs) have been reported among different types of jobs such as factory worker, typist, and teacher, which later lead to neck pain. This often develops an abnormal posture known as Forward Head Posture (FHP) due to the high demands of tasks involved with the job. McKenzie Exercise (ME) and postural correction (PC) are helpful in treating neck pain with FHP. However, no study compares ME and PC's effectiveness in patients with FHP due to daily activity. **Methodology:** 30 subjects suffering from FHP will be included and randomly allocated into the ME and PC groups. Both treatments will be prescribed three days per week for six weeks for all the participants. Participants will be assessed in terms of pain, Range of Motion (ROM), Neck Disability Index (NDI), Copenhagen Neck Functional Disability Scale (CDS), and Neck Bournemouth Questionnaire (NBQ). The results will be collected and analyzed using Statistical Package for the Social Sciences (SPSS). **Conclusion:** ME and PC both are safe and effective modalities and resulted in remarkable improvements in pain intensity, ROM, and functional neck ability in FHP patients above 50-year-old.

Keywords: McKenzie Exercise, Postural Correction, Work-related neck, and shoulder disorders, Forward Head Posture

INTRODUCTION

FHP is a serious condition that has become more common in recent years. Carrying the head forward of the shoulder's center is how it's characterized. The center of gravity shifts as the head travels forward. To compensate for the shift in the center of gravity, the upper body recedes, and the shoulders sag forward, putting the head in front of the trunk. (Kang JH, 2012; Yip CHT, Chiu TTW & Poon ATK, 2008).

The prevalence of neck pain among employees varies significantly around the world. It has been stated that it ranges from 34% to 54% in western countries, with Scandinavian countries having higher mean estimates than the rest of Europe and Asia. (Fejer R, Kyvik KO, & Hartvigsen J, 2006; Côté P, Cassidy JD & Carroll L, 2000). According to a Hong Kong telephone study, 64% of respondents had experienced neck pain in the previous 12 months (Chiu TTW & Leung ASL 2006). In 2008, % of 282 office workers in four Sudanese companies were using computers. (SM Eltayeb and colleagues, 2008). Iran has one of the highest rates of neck pain in Asia and the Pacific, with a substantial difference between urban (13.4%) and rural (17.9%) populations (Davatchi F et al., 2006, 2008, 2009). Neck pain was more common among Iranian dentists who flexed their neck for an extended period (28–61 %) (Chamani G et al., 2012).

For Malaysia, there has been an increase in office workers over the past few years (Eltayeb SM et al., 2008; Fernández-de-las-Peñas C et al., 2006). In Malaysia, it has been reported that MSDs are frequent among office workers (Silva AG et al., 2009). Malaysia's National Institute of Occupational Safety and Health (NIOSH) said that 61% of the jobs require computer use (Neumann DA & Rowan EE, 2002). MSDs cause significant lost work productivity and extended sick absence, both of which lead to an increased financial burden on businesses (Lau KT et al., 2010). According to the findings of a study conducted by (Shariat et al., 2016), 69.7% of office workers in Malaysia had a high pain intensity score in their lower back, shoulders, and neck. According to reports, women are more likely than males to suffer from MSD in the shoulders and neck. This was also confirmed by (Mahmud et al., 2012) (Arins M, 2000), who discovered that women are more susceptible to discomfort in the upper body and neck regions 72% than men 51%. This difference could be due to anthropometric differences between females and males, with workstations more typically constructed for the male gender. (Lau HMC et al., 2010)

Several causes contribute to this condition: sleeping with the head lifted too high, prolonged computer use, and a lack of established back muscle power. In the last decade, the widespread usage of computers in offices has increased the amount of time a person spends using a personal computer daily. Poor posture and the resulting neck pain may accompany these changes, leading to FHP.

OBJECTIVE

1. To investigate the effectiveness of McKenzie exercise on forward head posture

2. To investigate the effectiveness of Postural Correction on forward head posture

AIM

This study helps to find out which treatment is more effective and suitable for forward head posture patients to perform in any settings and anytime. Thus, patients will be more adhered to the treatment and perform the treatment effectively.

METHODOLOGY

A randomized controlled trial was carried out in this study. The study was conducted at outpatient department of Hospital Rehabilitasi Cheras, Kuala Lumpur Malaysia and expected to be completed within the timeframe of 1 year.

Study Sampling

Thirty participants who met the inclusion and exclusion criteria of the study were selected.

Subjects were given a consent form and explanation by the investigator before the study. They were allowed sufficient time to consider their participation in the study. Once they had agreed to participate, they were asked to fill in their name, IC number, and signature on the consent form. Then, they were divided randomly into the McKenzie Exercise group and Postural Correction group.

Treatment Duration

Patients had received the respective treatment for 6 weeks which they were asked to perform the treatment 3 days per week. After 6 weeks, they were reassessed.

Inclusion Criteria

- All male and female adults are age above 50-Year-Old
- Subjects willing to participate in the study
- History of neck pain with abnormal posture

Exclusion Criteria

- Patients who had neck pain originating from various pathologies, such as the presence of cord compression, radiculopathy, osteoporosis, or osteopenia (t score>-1)
- Patient who is using long-term anticoagulant or corticosteroid drugs.
- Neurological diseases, Stroke, vestibular impairment, visual problem, Parkinson's disease, paralysis, and any etiology.
- Orthopaedic problem
- Amputations, a bone fracture within six months

Study Variables

- Dependent variable: FHP
- Independent variables: ME, PC

Procedure

Participants will be assessed in terms of the range of motion, Neck Disability Index, Copenhagen Neck Functional Disability Scale, and Neck Bournemouth Questionnaire on first and last visit

Outcome Measure and Instumentation Measurement test

Pain severity

The visual analog scale (VAS) was used to assess the severity of pain at rest and during activity. Patients marked the severity of their pain on a 10-cm-long line (0 = no pain, ten = the worst pain possible).

Range of motion

The cervical range of motion will be assessed using a measuring tape. This will be evaluated in sitting position, for flexion and extension, measure the distance from the chin to the sternal notch. For lateral flexion, measure the distance from the mastoid process to the acromion process. For rotation, place a mark on your client's acromion process. Measure the distance from the tip of the chin to the acromion process (on the side to which the client rotates). The differences between these points will be recorded.

Neck Disability Index

The NDI can be scored as a raw score or doubled and expressed as a percent. (Vernon H & Mior S, 1991; Riddle DL & Stratford PW, 1998)

- Each section is scored on a 0 to 5 rating scale, in which zero means 'No pain' and five means 'Worst imaginable pain.'
- Points summed to a total score.
- The test can be interpreted as a raw score, with a maximum score of 50, or as a percentage.
- 0 points or 0% means: no activity limitations
- 50 points or 100% means complete activity limitation.

Copenhagen Neck Functional Disability Scale (CDS)

The CDS consists of 15 items. These items are individually answered by either 'yes,' 'occasionally,' or 'no.' A 'yes' indicates a good function for questions one to five. A 'no' means a good function for questions six till fifteen. A good function receives a score of zero, a poor function receives a score of two, and the answer 'occasionally' always receives one. (FEJER, R. et al., 2005)

Afterward, we add up all the scores of the questions to form the total score. This total score ranges from 0 to 30. The total score determines the level of functional disability, in which higher numbers represent a higher level of disability. A score of 0 indicates no neck complaints present, whereas 30 indicates that the patient is extremely disabled because of neck complaints. (JORDAN, A., MANNICHE, C., MOSDAL, C. & HINDSBERGER, C., 1998)

Neck Bournemouth Questionnaire (NBQ)

The questionnaires consist of 7 questions that contain the different dimensions of the ICF.

Each item is rated on a numeric rating scale (NRS) from 0 to 10:

- 0= Much better
- 5= no change
- 10= much worse.

The score for each measure is added. This can produce a value between a minimum score of 0 and a maximum score of 70. The higher the score reflects the degree of impact on a patient's life.

Intervention

McKenzie Exercise

The workout routine consisted of seven exercises performed at static maximum strength with 20 repetitions and a seven-second pause between each repetition. The participants did one 20-minute set three times a week for six weeks.

To ensure that the subjects executed the exercise correctly, the investigator offered adequate explanations and demonstrations, and the activity was supervised on day one. An exercise manual and diary were provided to track performance and verify program compliance, and the investigator double-checked both on a regular basis.

The exercises were performed in the following order: head retraction with overpressure while sitting, neck extension while sitting, head retraction with overpressure while lying, neck extension while lying, side bending of the neck while sitting, neck rotation while sitting, and neck flexion with chin-in in the sitting position.

Postural Correction

Principles of Body Mechanics

Load Position

Reinforced the concept of lifting and carrying objects as close to the center of gravity as possible.

- ➢ Had the patient practice carrying objects close to his or her center of gravity and draw attention to the feel of balance and control and less stress on the neck and back compared to the feel when carrying objects in more stressful positions. Pointed out that when lifting, the closer the object is held to the center of gravity, the less stress was placed on the supporting structures.
- ➢ Had the patient practice shifting the load from side to side and turning. Had the patient practice turning with hip rotation and minimal trunk rotation. The legs should direct the action while the spine is kept stable.
- ➢ Replicated the mechanics of the patient's job setting and practiced safe mechanics.

Environmental Adaptations

Home, Work and Driving Considerations

- ➢ Chairs and car seats should have lumbar support to maintain slight lordosis. Use a towel roll or lumbar pillow if necessary.
- ➢ Chair height should allow knees to flex to take tension off the hamstring muscles, support the thighs, and allow the feet to rest comfortably on the floor.

- Armrests should be used if prolonged sitting is required to take the stress off the shoulders and the cervical spine.
- Desk or table height should be adequate to keep the person from leaning over the work.
- Work and driving habits should allow frequent changing of posture. If normally passive, the patient should get up and walk every hour.

Data entry and analysis method

The result from the data collection is being analysed by SPSS 20.0. To assess the correlations between those tests, we used Spearman's correlation test in this study. Moreover, standardized canonical discriminant function coefficients identify the best fall risk predicting scale.

Table 1: Demographic characteristics of study samples

	Mean (SD)	Frequency	Percentage (%)
Gender			
Male		12	40
Female		18	60
Ethnicity			
Malay		14	46.7
Chinese		16	53.3
Study group			
ME		15	50
PC		15	50
Age	66.27 (11.8)		
Bodyweight	61.60 (19.7)		
Height	1.61 (0.09)		
BMI	23.54 (7.01)		

Note: SD: Standard deviation; ME: McKenzie exercise; PC: Postural correction

RESULT

Through Wilcoxon signed-rank test, the ME group showed statistically significant improvement at the post-intervention in relation to pre-intervention values, with a significant difference of p<0.01. For NDI, post-intervention having a (mean=12.59) prove better than pre-intervention (mean=23.51). For CDS, post-intervention having a (mean=5.20) prove better than pre-intervention (mean=17.67). For NBQ, post-intervention having a (mean=9.20) prove better than pre-intervention (mean=23.51). For VAS, at rest during the post-intervention show (mean=0.40) better than at rest during post-intervention (mean=1.27) while at activity during post-intervention having (mean=2.00) better than at activity during pre-intervention with (mean=4.20). On the other hand, the PC group also showed statistically significant improvement at the post-intervention in relation to pre-intervention values, with a significant difference of p<0.01. For NDI, post-intervention having a (mean=13.67) prove better than pre-intervention (mean=15.40). For CDS, post-intervention having a (mean=6.20) prove better than pre-intervention (mean=6.80). For NBQ, post-intervention having a (mean=10.00) prove better than pre-intervention (mean=14.00). For VAS, at rest during the post-intervention show (mean=0.67) better than at rest during post-intervention (mean=1.13) while at activity during post-intervention having (mean=2.00) better than at activity during pre-intervention with (mean=3.60).

Through Wilcoxon signed-rank test, the ME group showed statistically significant improvement at the post-intervention in relation to pre-intervention values, with a significant difference of p<0.01. For ROM Flexion, post-intervention having a (mean=7.35) prove better than pre-intervention (mean=6.64). For ROM Extension, post-intervention having (mean=4.55) proves better than pre-intervention (mean=3.48). For ROM Left Lateral Flexion, post-intervention having a (mean=4.31) prove better than pre-intervention (mean=3.71). For ROM Flexion, post-intervention having a (mean=4.05) prove better than pre-intervention (mean=3.29). For ROM Left Rotation, post-intervention having a (mean=7.29) prove better than pre-intervention (mean=6.25). For ROM Right Rotation, post-intervention having a (mean=7.40) prove better than pre-intervention (mean=6.62).

For PC Group, For ROM Flexion, post-intervention having a (mean=9.30) prove better than pre-intervention (mean=7.53). For ROM Extension, post-intervention having a (mean=8.08) prove better than pre-intervention (mean=6.84). For ROM Left Lateral Flexion, post-intervention having a (mean=7.35) prove better than pre-intervention (mean=6.64). For ROM Right Lateral Flexion, post-intervention having a (mean=6.90) prove better than pre-intervention (mean=5.66). For ROM Left Rotation, post-intervention having a (mean=9.75) prove better than pre-intervention (mean=8.54). For ROM Right Rotation, post-intervention having a (mean=9.56) prove better than pre-intervention (mean=8.21).

When compared between ME and PC group, there was a significant difference in NDI, CDS, NBQ, and ROM Flexion values with P-values of 0.000, 0.000, and 0.006. (Table 4). With this, the mean rank for the ME group was higher than the PC group, which indicated that ME was more effective than PC in improving Functional Ability even though both treatments were found to be

beneficial. When ROM of Neck was assessed, there was a significant difference between the ME and PC groups with P-values of 0.018 (Table 4). According to our findings, the mean rank for Flexion ROM was greater in the ME, and this proved that ME had more effect in improving flexion. According to our findings, the mean rank for Flexion ROM was greater in the ME, and this proved that ME had more effect in improving flexion ROM when compared to PC that, doesn't have a significant effect compared to it.

Table 2: Results of NDI, CDS, NBS, VAS at rest and activity in ME and PC Group

	Mean	SD	Percentile		Z	p[a]
			25th	75th		
ME group						
NDI- pre intervention	23.51	11.37	17.78	30.00	-3.410	0.001
NDI- post intervention	12.59	6.52	8.89	18.00		
CDS- pre-intervention	9.13	3.70	8.00	12.00	-3.315	0.001
CDS- post-intervention	5.20	2.14	4.00	7.00		
NBQ- pre-intervention	17.67	8.16	12.00	23.00	-3.413	0.001
NBQ- post-intervention	9.20	4.89	6.00	13.00		
VAS at rest- pre-intervention	1.27	1.22	0.00	2.00	-2.739	0.006
VAS at rest- post-intervention	0.40	0.74	0.00	1.00		
VAS during activity- pre-intervention	4.20	1.78	3.00	4.00	-3.325	0.001
VAS during activity- post-intervention	2.00	1.13	1.00	3.00		
PC group						
NDI- pre intervention	15.40	7.63	10.00	20.00	-2.636	0.008
NDI- post intervention	13.67	5.50	10.00	18.00		
CDS- pre-intervention	6.80	2.76	5.00	7.00	-2.121	0.034
CDS- post-intervention	6.20	1.74	5.00	7.00		
NBQ- pre-intervention	14.00	9.23	8.00	16.00	-3.427	0.001
NBQ- post-intervention	10.00	6.30	5.00	14.00		
VAS at rest- pre-intervention	1.13	1.64	0.00	2.00	-2.333	0.020
VAS at rest- post-intervention	0.67	1.23	0.00	1.00		
VAS during activity- pre-intervention	3.60	1.92	2.00	5.00	-3.384	0.001
VAS during activity- post-intervention	2.00	1.51	1.00	3.00		

Note SD: Standard deviation; ME: McKenzie exercise; PC: Postural correction; NDI: Neck disability scale; CDS: Copenhagen disability scale; NBQ: Neck Bournemouth Questionnaire; VAS: Visual analog scale; a: Wilcoxon signed ranks test.

Table 3: Results of ROM flexion, extension, left and right lateral flexion, left and right rotation in ME and PC Group.

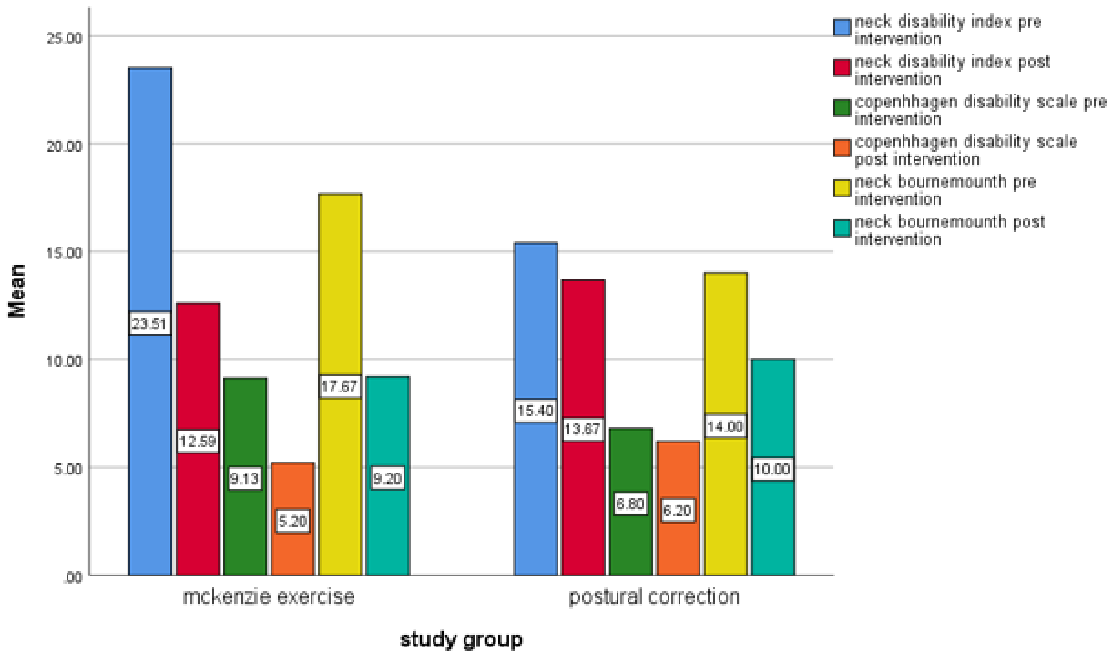
	Mean	SD	Percentile		Z	p[a]
			25th	75th		
ME group						
ROM flexion-pre intervention	6.64	2.83	4.00	9.00	-2.692	0.007
ROM flexion-post intervention	7.35	2.59	5.50	10.00		
ROM extension-pre intervention	3.48	1.90	1.50	5.00	-3.343	0.001
ROM extension-post intervention	4.55	1.95	2.70	6.50		
ROM left lateral flexion-pre intervention	3.71	2.22	2.00	4.70	-2.630	0.009
ROM left lateral flexion-post intervention	4.31	2.04	3.00	5.00		
ROM right lateral flexion-pre intervention	3.29	1.17	2.00	4.00	-2.167	0.030
ROM right lateral flexion-post intervention	4.05	1.60	3.00	4.30		
ROM left rotation-pre intervention	6.25	3.40	4.00	8.00	-1.963	0.050
ROM left rotation-post intervention	7.29	3.23	5.00	9.00		
ROM right rotation-pre intervention	6.62	3.36	5.00	7.50	-2.099	0.036
ROM right rotation-post intervention	7.40	3.34	5.00	10.00		
PC group						
ROM flexion-pre intervention	7.53	3.75	4.00	10.50	-3.309	0.001
ROM flexion-post intervention	9.30	3.02	7.00	11.50		
ROM extension-pre intervention	6.84	3.53	4.50	8.00	-2.924	0.003
ROM extension-post intervention	8.08	3.38	6.00	9.00		
ROM left lateral flexion-pre intervention	6.00	3.50	4.00	7.50	-3.077	0.002
ROM left lateral flexion-post intervention	7.10	3.58	4.50	10.50		
ROM right lateral flexion-pre intervention	5.66	3.49	2.50	8.50	-3.094	0.002
ROM right lateral flexion-post intervention	6.90	3.54	4.00	9.50		
ROM left rotation-pre intervention	8.54	1.55	7.00	9.50	-3.190	0.001
ROM left rotation-post intervention	9.75	1.80	8.50	11.00		
ROM right rotation-pre intervention	8.21	1.68	7.00	9.20	-3.087	0.002
ROM right rotation-post intervention	9.56	1.60	8.00	10.00		

Note: SD: Standard deviation; ME: McKenzie exercise; PC: Postural correction; ROM: Range of motion; a: Wilcoxon signed ranks test

Table 4: Comparison of Outcome Results between ME and PC Group

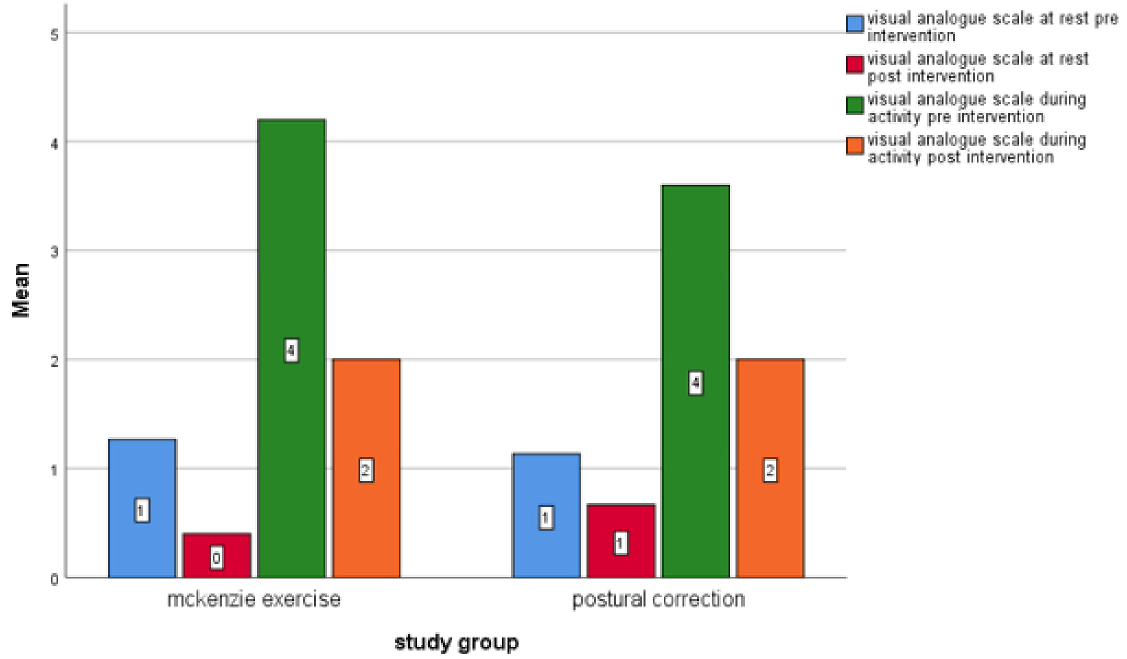
Outcome	Mean Rank	Mean difference	SE difference	95% CI of the difference		U	P[a]
				Lower	Upper		
NDI							
ME	22.47	9.19	1.63	5.78	12.60	8.00	0.000
PC	8.53						
CDS							
ME	21.57	3.33	0.64	2.03	4.63	21.50	0.000
PC	9.43						
NBQ							
ME	19.90	4.47	1.48	1.44	7.49	46.50	0.006
PC	11.10						
VAS at rest							
ME	17.50	0.40	0.27	-0.16	0.96	82.50	0.173
PC	13.50						
VAS during activity							
ME	17.93	0.60	0.35	-0.12	1.32	76.00	0.110
PC	13.50						
ROM flexion							
ME	19.23	1.05	0.44	0.15	1.96	56.50	0.018
PC	11.77						
ROM extension							
ME	16.47	0.17	0.31	-0.48	0.82	98.00	0.537
PC	14.53						
ROM left lateral flexion							
ME	17.60	0.50	0.31	-0.13	1.13	81.00	0.179
PC	13.40						
ROM right lateral flexion							
ME	18.27	0.48	0.42	-0.39	1.35	71.00	0.082
PC	12.73						
ROM left rotation							
ME	17.47	0.17	0.49	-0.85	1.20	83.00	0.219
PC	13.53						
ROM right rotation							
ME	17.50	0.57	0.41	-0.27	1.41	82.50	0.208
PC	13.50						

Note: SE: Standard error; ME: McKenzie exercise; PC: Postural correction; NDI: Neck disability scale; CDS: Copenhagen disability scale; NBS: Neck Bournemouth scale; VAS: Visual analog scale; ROM: Range of motion; a: Mann-Whitney test



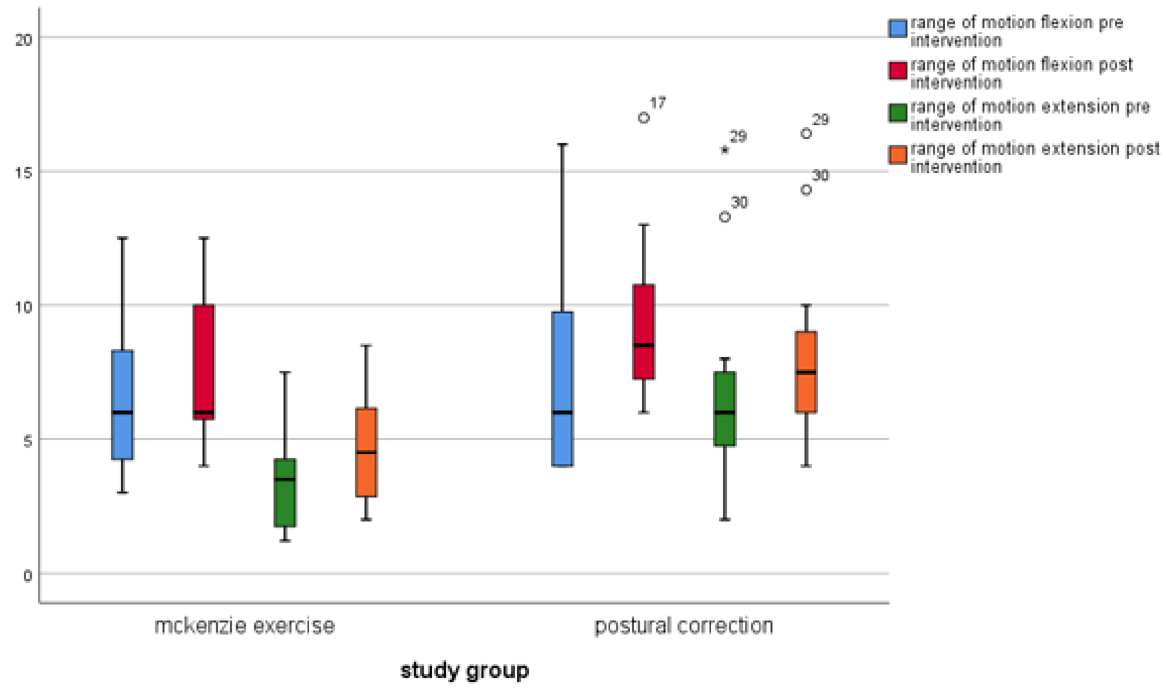
Note: ME: McKenzie exercise; PC: Postural correction; NDI: Neck disability scale; CDS: Copenhagen disability scale; NBQ: Neck Bournemouth Questionnaire

Graph 1: Distribution of NDI, CDS, and NBQ in pre and post-intervention between ME and PC group



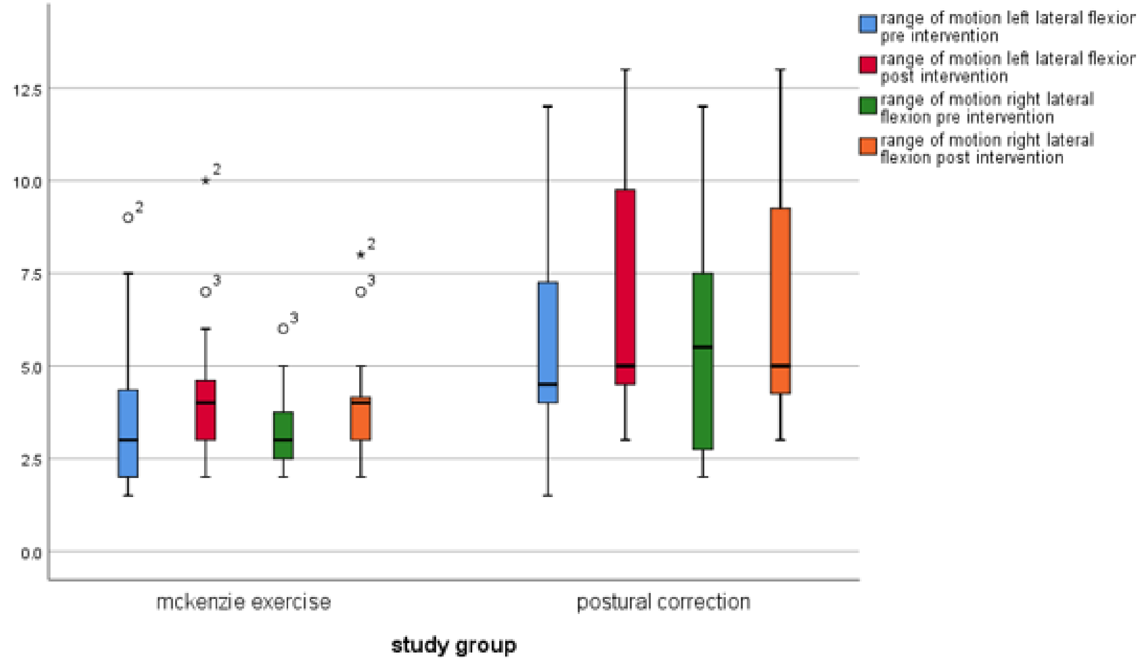
Note: ME: McKenzie exercise; PC: Postural correction; VAS: Visual analog scale

Graph 2: Distribution of VAS at rest and during activity in pre and post-intervention between ME and PC group



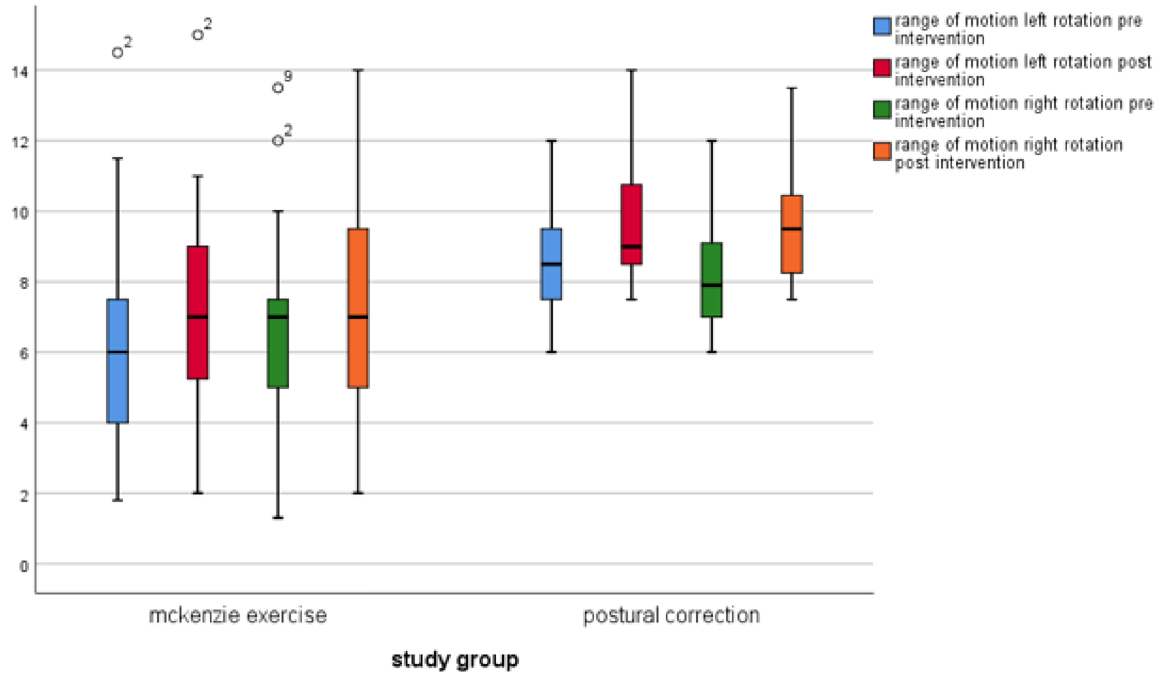
Note: ME: McKenzie exercise; PC: Postural correction; ROM: Range of motion

Graph 3: Distribution of ROM flexion and extension in pre and post-intervention between ME and PC group



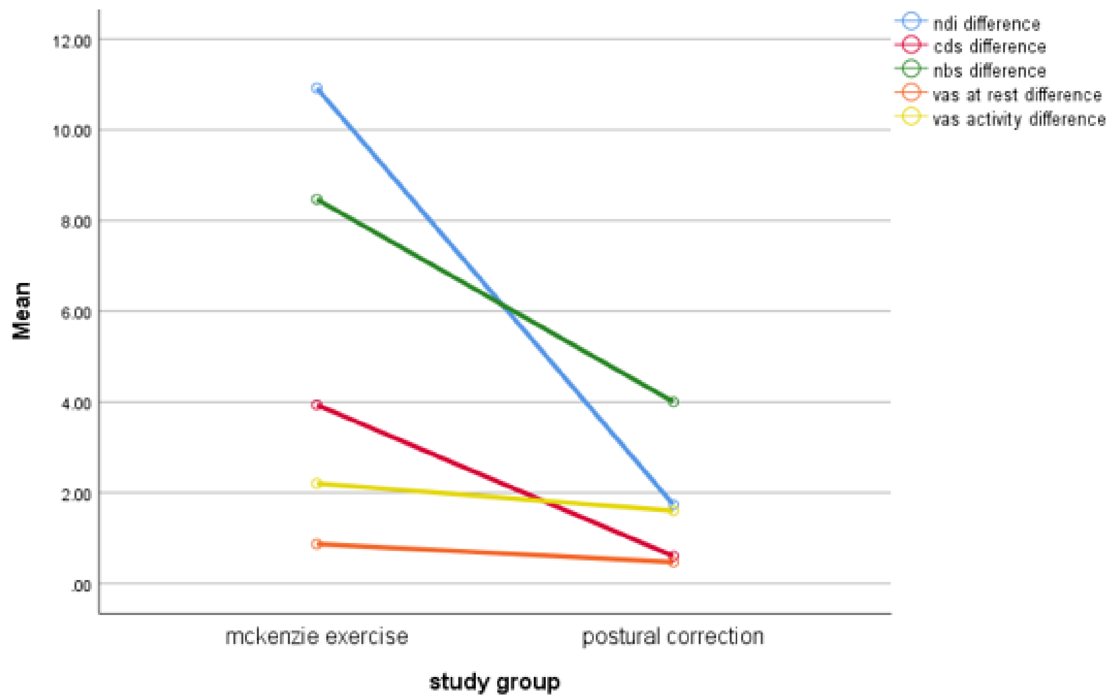
Note: ME: McKenzie exercise; PC: Postural correction; ROM: Range of motion

Graph 4: Distribution of ROM left and right lateral flexion in pre and post-intervention between ME and PC group



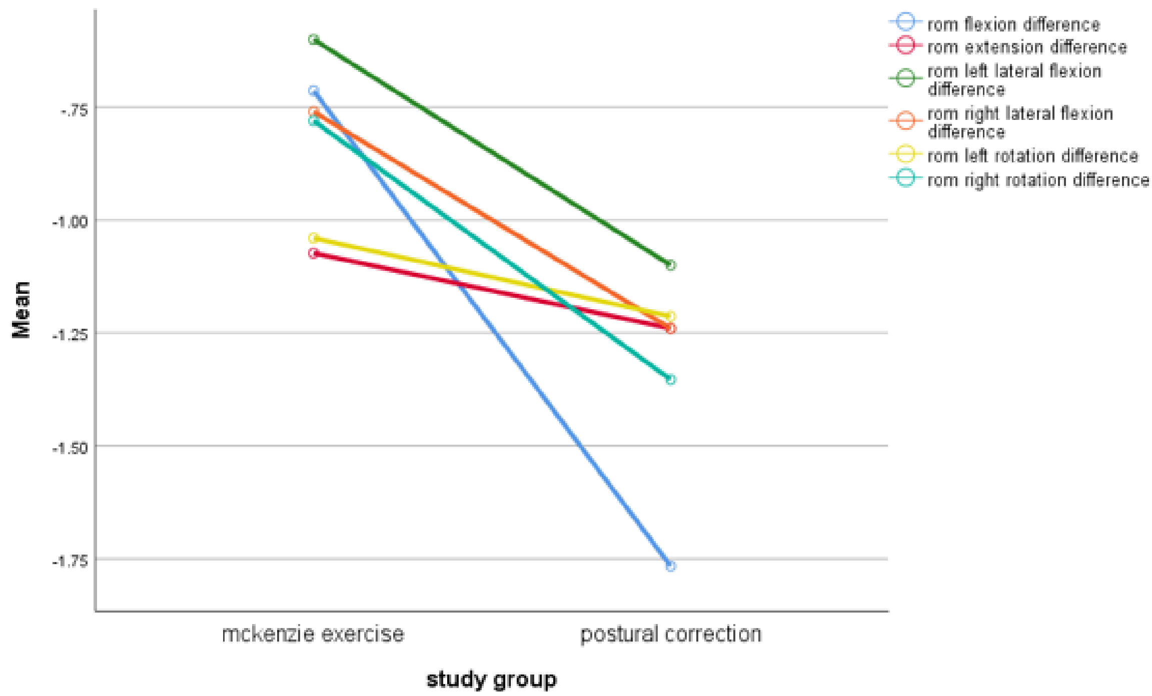
Note: ME: McKenzie exercise; PC: Postural correction; ROM: Range of motion

Graph 5: Distribution of ROM left and right rotation in pre and post-intervention between ME and PC group



Note: ME: McKenzie exercise; PC: Postural correction; NDI: Neck disability scale; CDS: Copenhagen disability scale; NBQ: Neck Bournemouth Questionnaire; VAS: Visual analog scale

Graph 6: Distribution showing changes after intervention in NDI, CDS, NBQ, VAS at rest and during activity between ME and PC group



Note: ME: McKenzie exercise; PC: Postural correction; ROM: Range of motion

Graph 7: Distribution showing changes after intervention in ROM flexion, extension, left and right lateral flexion, left and right rotation between ME and PC group

DISCUSSION

This is the first randomized controlled study comparing the effects of ME and PC in a patient with FHP. In addition, the present study is the first study in which ME were compared with other interventions such as Kinesio taping or myofascial release in term of craniovertebral angle, cranial rotation angle, and acromion tragus length. The objective of this study was to find out whether exercise is more effective than self-awareness on correcting posture in treating forward head posture with or without pain. Our study found that both ME and PC were beneficial for patients with forward head posture in terms of pain, ROM, and functional ability. However, the improvement in NDI, CDS, NBQ, and ROM Flexion values was greater in the Me group than the PC group.

According to my finding on ME, which proves that the ME group showed statistically significant improvement at the post-intervention in relation to pre-intervention values, with a significant difference of $p<0.01$ in terms of pain, ROM, and Functional Ability.

CONCLUSION

In conclusion, ME and PC are both safe and effective interventions, resulting in great improvements in pain intensity, ROM, and functional neck ability in FHP patients above 50-year-old.

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