

Feasibility Testing of a Developed Video-Based McKenzie Protocol in the Management of Neck Discomfort

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Abstract

Background: Neck pain management has become a burden among patients due to economic hardship, waiting time in the hospital, and inadequate personnel around the nation.

Objective: The study developed a video using some exercises of McKenzie for addressing the discomfort associated with neck.

Method: Ten consenting individuals with neck discomfort attending the outpatient clinic of the Physiotherapy unit of the Teaching Hospitals belonging to the Obafemi Awolowo University Ile-Ife, Osun state, Nigeria participated in the study. A model demonstrated seven McKenzie exercises for neck pain as instructed by an instructor and a video clip of the demonstration was produced. The recruited patients were taught how to use the clips and each used the clip to guide them in the exercises. The exercise was practiced for 4 weeks as indicated in the clip; they were monitored weekly by telephone. The feasibility of the clip was evaluated using a USE questionnaire. A verbal rating scale and an index to measure neck disability were employed to measure the severity of pain and disability of the neck before and after the exercise period. Data was summarized using a dependent t-test. The level of significance was set at 0.05.

Results: Four (40%) males and six (60%), females participated in the study with a mean age of 45.60 ± 21.54 years. The usability of the video clip was excellent or 100% and a significant reduction was observed in the pain intensity ($t=6.069$, $p=0.000$), but disability did not show any significant change ($t=0.950$, $p=0.355$).

Conclusion: The video-based McKenzie exercise clip was effective in managing neck pain, and it is feasible for practice among patients.

Keywords: Neck pain, McKenzie, exercises, disability, feasibility.

INTRODUCTION

In 2019, a prevalence rate of 27.0 per 1000 population globally for non-specific neck pain was recorded, making it among the leading musculoskeletal disorders compared to low back pain [1]. Neck pain has resulted in a huge burden considering the cost of treatment, reduction in the level of productivity and absenteeism from work [2]. Records from the United States of America reported that in 154 different conditions as of the year 2016, those that consumed more spending for treatment were neck pain and low back pain was estimated to be more than 134 billion US dollars [3]. More to this, neck pain was responsible for more than 25 million absenteeism among Americans in 2012 [4]. The major contributory factors to the development of neck pain include stress, some cognitive factors, neuromuscular preexisting factors and autoimmune disorders [2].

Ayaniyi and colleagues, [5] compared the prevalence of neck pain in an individual's lifetime among sexes; female students had a higher preponderance of neck pain. They concluded that neck pain was rampant in Nigerian undergraduates, and girls were more affected

than boys. The higher the level of study, the more the prevalence, with the highest number of students going to the clinic.

An integral element in the intervention used in neck pain is exercise therapy, as well as manual therapy, stimulation of the nerves using an electrical current, ultrasound therapy, irradiation with infrared rays, and the use of physical agents with massage therapy. Ergonomic counselling alongside sustained physical activities and exercises are often combined as a form of treatment [6]. Exercise therapy is a common physiotherapy intervention which includes specific types of exercises, such as neuromuscular training, and strengthening of the muscles at the cervical, shoulder and scapulothoracic; others are upper extremity endurance training, cervical stabilization exercises and isometric exercises. Dusunceli, *et al.* [7], however, demonstrated the increased effectiveness of exercises for neck stabilization, and reduction in the severity of pain and disability in comparison with isometric and stretching exercises. In addition, selected exercises were found to generate better outcomes than a combination of physical modalities [7]. Reports established that exercises for strengthening, and those of endurance had little to great extent in ameliorating pain, and reducing disability, but the specifics and details of these exercises were not mentioned [8]. An area of emerging popularity and increased need is

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Tele-rehabilitation. It can ensure optimal outcomes when combined with the regularly timed interventions and intensity by the therapist. It has been reported that home programs given to patients were more effective with telerehabilitation [9]. It has various modes of delivery, it could be through media, video, information and communication technology. One of the benefits of telerehabilitation is that it removes the barrier of moving from one place to the other looking for treatment, specifically regarding individuals with challenges of mobility. This improvement in rehabilitation creates a better opportunity to maximize the strategies in the care of patients [10]. Although the primary goal of telerehabilitation may have been to enhance equitable access, it has been suggested that the quality of care may also be enhanced by this service delivery model [11]. Telerehabilitation, however, has not been optimized for the treatment of patients with neck pain, especially in Nigeria. It is therefore imperative that more studies on its feasibility and development be done to further knowledge in this area and also improve the quality of care received by patients in this category, especially in Nigeria. More importantly, the cost of transportation, the bureaucracy of seeing a physiotherapist in the hospitals, the cost of treatment and consuming time, which are not patient-friendly necessitated a move to provide take-home tools for self-management of neck pain for the patients. The research therefore provided a McKenzie exercise protocol in a video form that is easier to follow for the management of neck pain (S1).

MATERIAL AND METHOD

Participant

Participants recruited for the research included individuals with pain in the neck who are being treated at the Physiotherapy Clinic one of the teaching hospitals belonging to the Obafemi Awolowo University in Ile-Ife, Nigeria. Patients with neck pain who present with all classes of signs and symptoms include disorders associated with whiplash; neck pain of prolonged period of no definite cause, pain at the neck related to work, neck pain of myofascial origin, myalgia of the upper trapezius, prolonged pain at the neck related to degeneration which produces with or without radiation. However, patients with neck pain and any psychiatric illness, epilepsy, metastatic cancer and other associated co-morbidities and patients with neck pain admitted to the hospital were excluded from the study.

Study Plan

The study is cross-sectional employing a quantitative research design.

Sampling Technique

The participants were recruited using a purposive sampling technique.

Sample Size Calculation

According to Sauro [12], the sample size for usability can be calculated using:

$$\text{Log}(1-X)/\text{Log}(1-Y)$$

Where X = Percentage chance of detecting the problem and Y is the probability of occurrence. For this study, X is 82% and Y is 23%.

$$\begin{aligned} &\text{Log}(1-0.82)/\text{log}(1-0.23) \\ &= 6.56 \\ &= 7 \end{aligned}$$

10 participants were recruited for this study.

Site of the Study

Physiotherapy Out-patient Clinic, Department of Medical Rehabilitation, teaching hospital belonged to the Obafemi Awolowo University in Ile-Ife, Nigeria.

Instruments

- i. **Use Questionnaire:** Fully known as; the Usefulness, Satisfaction and Ease of Use Questionnaire [13], this instrument examines how easily a product or a service is easy to be used. It is a 30-item survey that examines how useful, the simplicity of usage, easy to learn and how satisfying the questionnaire is.
- ii. **Verbal Rating Scale:** It is an established measurement for recent and prolonged pain. It can be called pain which can be scored verbally and scales that can be described verbally, it is a self-report tool designed with many statements that can describe pain intensity [14].
- iii. **Neck Disability Index:** It measures disability as related to pain through self-report with 10 –items but relies on disability questionnaire according to Oswestry.

Procedure

The study was approved by the Ethics and Research Committee of the teaching hospital of the Obafemi Awolowo University with the number ERC/2022/01/07. Before the beginning of the study, participants were informed of the plan, and the consent was obtained. The study involved the use of evidence-based exercise protocols as proven by systematic reviews showing the validity of exercise interventions [15]. The intervention used general neck exercise training to increase endurance, strengthen the muscles and stabilise the neck [16].

Following the McKenzie protocol for neck pain management [17]:

Extension Dysfunction Exercises

- i. **Retraction:** The subjects were instructed to assume a sitting position that is comfortable and well supported at the back, the subjects were told to retract the head backwards maximally, head kept straight, with no down or up movement. This position would be held for 2 seconds; the exercise would be repeated 10 times (**Fig. 1**) [17].



Fig. (1): Retraction Exercise by a patient.

- ii. **Retraction with Overpressure of Patient Head:** The subjects were instructed to sit comfortably, well supported at the back support, and told to repeat the procedure of pulling back the head without inclining up or down while keeping the head in a horizontal position. The subjects were then further instructed to press the chin with their fingers and sustain it in the form of overpressure when the movement was the end. This position was held for 2 seconds; the exercise was repeated 10 times then the head was returned to the original state at every time (**Fig. 2**) [17].

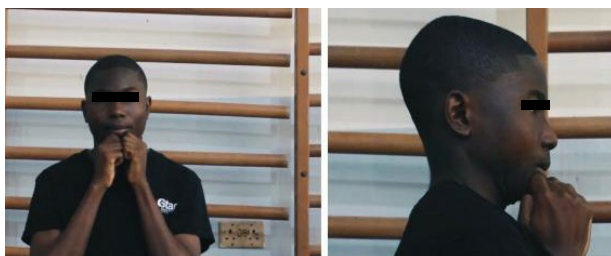


Fig. (2): Head retraction with overpressure.

- iii. **Retraction with Extension:** Each subject was told to sit down with their back well supported comfortably. Furthermore, the head was drawn back as far as possible but remained horizontal facing forward. The head will be bent backwards as if looking into the sky or ceiling, after that, it will be returned to the normal state. Subjects were then instructed to repeat the movements ten times while returning to the neutral position each time (**Fig. 3**) [17].



Fig. (3): Retraction exercise with extension.

Rotation Dysfunction Exercises

- i. **Rotation:** Subjects assumed a relaxed well-supported back having sitting comfortably. The head was then retracted to mid-range and then rotated towards the painful side. Subjects would be instructed to turn as far as they can as if focusing the shoulder on the right and left side. Maintaining the same position for two seconds, the subjects were instructed to return to the neutral posture. There was a repetition of the movement ten times, and patients returned to the same position at every time (**Fig. 4**) [17].

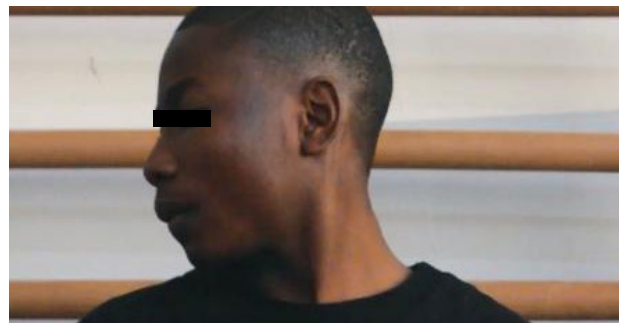


Fig. (4): Head Rotation exercise.

- ii. **Rotation with Overpressure on the Patient:** Each patient was sitting comfortably with their back well supported. Neck retraction movements were instructed followed by active rotation. The right hand was placed behind the head while fingers were reaching the left ear, the left hand reached the chin with extra pressure to push further into rotation. The position was held for two seconds and the patient was told to return to the neutral position. This is repeated in the contralateral side (**Fig. 5**) [17].

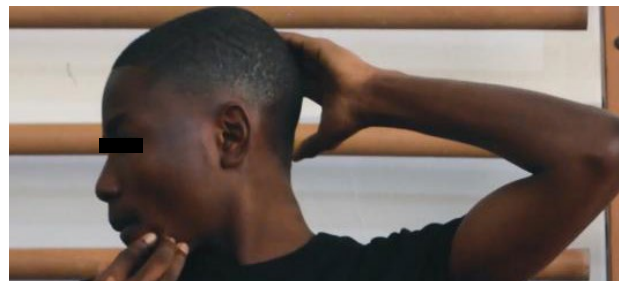


Fig. (5): Rotation with patient overpressure.

Forward Flexion Dysfunction Exercises

i. **Flexion:** Sitting in a relaxed well well-supported comfortable position was assumed by each of the patients. The head was retracted, and the chin touched the chest in a flexed position. Patients were in this position for two seconds and returned to a neutral position and the movement was repeated 10 times (**Fig. 6**) [17].

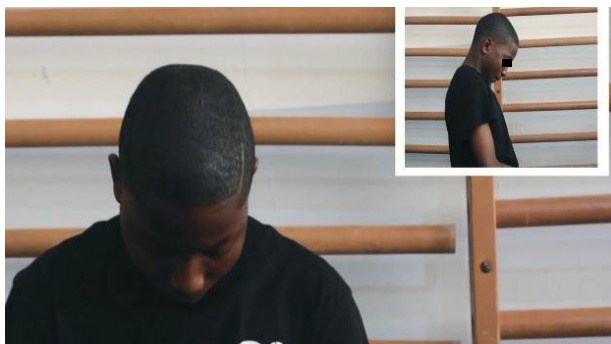


Fig. (6): Forward flexion.

ii. **Lateral Flexion:** The most comfortable sitting position was assumed with maximum backrest by each patient. The head was retracted, the head bent towards the painful side, and the right and left ear were turned towards the shoulder region. The exercise was repeated ten times and returned to the neutral position each time (**Fig. 7**) [17].



Fig. (7): Lateral flexion.

iii. **Lateral Flexion with Patient Overpressure:** The subjects were instructed to assume a relaxed comfortable sitting position with good back support and then instructed to retract the head, followed by an active lateral flexion. The subjects were further instructed to place their left/right hand (this is dependent on the side of pain detected) over their head with fingers reaching to the right ear, and gently pull head down to their shoulder. After two seconds in that position, the subjects were instructed to return to the upright posture. The manoeuvre was repeated ten times and then returned to the normal position (**Fig. 8**) [17].



Fig. (8): Lateral flexion with patient overpressure.

These recommended physical therapy interventions were made into a video demonstrating each intervention.

The video was developed by a physiotherapist (the instructor), and a digital technician recorded the video after the participant consented. After the development of the video, ten participants with pain in the neck for a prolonged period were recruited to replicate the video exercises. This was done twice weekly for four weeks. At the end of 4 weeks, the feasibility assessment was carried out using a feasibility questionnaire according to Lee *et al.* [18]. Participants were asked to complete the questionnaire. The severity of pain and disability of the neck was measured using a visual analogue scale and disability index for the neck one after the other, before the exercise and after 4 weeks of the exercises.

Data was analysed using SPSS version 21. Descriptive and inferential statistics. Inferential statistics of paired-t-test were used to examine the difference between the baseline and the after four weeks severity of pain and neck disability. The level of significance was set at 0.05.

RESULTS

Subjects Socio-Demographic Variables

Socio-demographic details of the subjects are presented in Table 1. There were four males and 6 females who took part in the study to make up 10 subjects, 2(20%) of these were lecturers, 3(30%) were students and 2(20%) were traders.

Table 1: Sociodemographic characteristics of participants.

Variables	Frequency	Percentage
Sex		
Male	4	40
Female	6	60
Total	10	100
Occupation		
Lecturer	2	20
Retiree	1	10
Student	3	30
Tailor	1	10
Teacher	1	10
Trader	2	20
Total	10	100

The physical characteristics of the subjects are shown in Table 2. The minimum, maximum and mean age in years were 23, 84 and 45.60 ± 21.54 . The minimum, maximum and mean weight in kilograms were 45, 68, and 56.30 ± 6.58 . The mean body mass index of the participants was $20.64 \pm 3.85 \text{ kg/m}^2$.

Table 2: Physical characteristics and occupation of participants (N=10).

Variables	Minimum	Maximum	Mean \pm SD
Age/yrs	23.00	84.00	45.60 ± 21.54
Weight/Kg	45.00	68.00	56.30 ± 6.58
Height/m	1.46	1.83	1.66 ± 0.12
BMI/Kg/m ²	16.10	30.20	20.64 ± 3.85

Shown in Table 3 is the usability of the video-based McKenzie protocol for neck pain. It was observed that the subject reported excellent regarding the frequency and usability of the video-based McKenzie protocol.

Table 3: Table showing the usability of video-based McKenzie protocol for Neck Pain (N=10).

Variables	Poor	Good	Very Good	Excellent
Frequency	0	0	0	10
Usability	0	0	0	10
Total	0	0	0	10
Percentage	0	0	0	100

Comparison Between Male and Female Pain Intensity and Disability

Table 4 below shows the comparison between the baseline and after four weeks of pain intensity of the video-based McKenzie protocol. There was a significant difference between the baseline and after four weeks of the severity of pain ($t=6.096$; $p=0.000$). However, there was no appreciable difference in disability between the baseline and after four weeks ($t=0.950$; $p=0.335$).

DISCUSSION

The research produced a McKenzie exercises protocol in video-based form and tested its feasibility among patients with neck pain attending teaching hospitals of the Obafemi Awolowo University Ile-Ife and its effectiveness in the management of pain and disability of chronic neck pain. During the video development, a model demonstrated the McKenzie neck exercises and was recorded. After these ten individuals with neck pain of no specific cause made use of the video as a guide in performing these exercises at home. The participants who completed the video-based program attested to its

feasibility by filling out a feasibility questionnaire. A hundred percent or excellent usability was reported by the users while the effectiveness of this intervention in terms of pain intensity and disability revealed that pain intensity was reduced but had no effect on disability. The finding of this study regarding the decrease in the severity of the pain and unchanged disability of the neck was similar to those of Baumann *et al.* [19] who reviewed the literature and did a meta-analysis. It was noted in the study that the method of mechanical diagnosis and therapy (MMDT) by McKenzie provided a very small though important reduction in pain at the neck in comparison with the control intervention however, there was no significant disability. Again, Neeraj and Shiv, [20] compared the effectiveness of strengthening of neck muscle and McKenzie neck exercise in patients with pain in the neck. Forty-five patients were conveniently selected and randomized to three groups, a group for McKenzie, another for strengthening and the third group for hop packs and postural corrections. All the groups had four weeks of intervention, there was a significant improvement in the McKenzie group compared to the others. The findings of our study agreed with their submission.

The result implies that the use of these video-based McKenzie exercises may provide an adjunct and alternative platform of intervention for individuals with pain in the neck who may require the intervention of a physiotherapist. A previous report ascertained the use of video-based rehabilitation, and this study aligns in the same direction which speaks to the feasibility of the use of telerehabilitation for physical therapy interventions. Tele-rehabilitation for neck pain has been found feasible and relatively effective in the treatment [21]. The satisfaction level, how usable the video is and the motivational level of the telerehabilitation service- exercise-based were found to be excellent in a study that worked which introduced remote physical rehabilitation for patients with chronic disorders. This worked by means of telemedicine, again, it was found that telemedicine supported outpatient rehabilitation programs as a partial replacement of face-to-face care, in rehabilitation, it was proved effective as an outpatient program [22]. Tele-rehabilitation used in managing shoulder and neck pain among elders is effective in alleviating pain and restoring function. For the improvement of quality of life, especially in

Table 4: Dependent t-test comparing the 'pre' and 'post' pain intensity and disability data in participants with Neck pain (N=10).

Variables	Pre-treatment Mean \pm SD	Post-treatment Mean \pm SD	t-value	P-value
Pain intensity	5.10 ± 1.29	2.10 ± 0.88	6.096	0.000*
Disability	23.40 ± 6.47	20.80 ± 5.75	0.950	0.355

elderly patients and in areas of poor medical benefits, telerehabilitation is highly recommended [23].

CONCLUSION

The outcome of the study showed that the McKenzie exercise protocol produced video-based is effective easy to use, well understandable and satisfactory in the management of patients with neck pain.

ETHICAL APPROVAL

Ethical approval was obtained from the Institutional Review Committee of the teaching hospital of Obafemi Awolowo University (REF letter No. ERC/2022/01/07). All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and the Helsinki Declaration.

CONSENT FOR PUBLICATION

Written informed consent was taken from the participants.

AVAILABILITY OF DATA

The data set may be acquired from the corresponding author upon a reasonable request.

FUNDING

Declared none.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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AUTHORS' CONTRIBUTION

O.A.O.: Study concept, designing, result analysis and interpretation, **O.T.:** Initial write-up, data collection manuscript drafting, **A.T.O.:** critical review and revision of initial draft.

SUPPLEMENTARY MATERIAL

The supplementary material is available on the publisher's website.

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