



Evaluating Align's Effectiveness as a Telemedicine Physical Therapy App for Treating Neck Pain in Office Workers

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(Received: 07 October 2023

Revised: 12 November

Accepted: 06 December)

KEYWORDS

eHealth,
telerehabilitation,
Physical Therapy,
Telemedicine,
Cervical Pain,
MedTech,
workplace-based,
Office
Professionals

ABSTRACT:

Background: With rising healthcare costs that affect each patient's health and well-being, neck pain is emerging as a significant public health concern. One-year prevalence rates of cervical pain are significantly greater in computer professionals than in the overall population, indicating that they represent a particular population at high risk of developing neck discomfort. Patient-driven and patient-centred treatment must be included. One new development in healthcare is the use of mobile applications for management. The ability of mobile health (mHealth) to transcend geographical and temporal limitations and reach patients and healthcare professionals at any time and place makes it a preferred way of healthcare delivery. Nevertheless, there is scientific evidence for only a few mobile healthcare management applications.

Objectives: To evaluate the usability and effectiveness of "Align" a mobile-based physical therapy application for treating office workers' neck pain.

Methodology: Participants in this experimental descriptive study were enrolled after being assessed for inclusion criteria, and had pre- and post-assessments for outcome measurements, after which the intervention protocol was obtained via the smartphone mobile app. Twelve sessions in total over two weeks.

Results: A decrease in the Numerical Pain Rating Scale scores ($p < 0.005$) indicated a significant reduction in neck pain among the participants ($N=107$) who finished the intervention protocol. The Neck Disability score also showed a significant improvement, dropping by 4 points ($p < 0.005$). Participants also demonstrated higher Positive Functioning Inventory and Postural Awareness scores ($p < 0.005$).

Conclusion: This study demonstrates the beneficial effects of the created mobile application for physical therapy for neck pain. The encouraging outcomes point to the necessity of additional research, such as randomised controlled trials, to determine how beneficial mobile applications are compared to standard clinical care.

1. Introduction

The last several decades have seen a major global transformation due to the development of information technology. (1–3) Improving one's overall health, mental health, and self-care is now crucial for increasing one's productivity and sustainability.

Screens, whether on computers, tablets, or mobile phones, have significantly expanded due to technological

breakthroughs and digitalisation. In one way or another, using a digital screen has become commonplace. The organisation of work, daily tasks, and professional and social interactions have all changed as a result, continuously testing the physical and mental limits of an individual.

It is frequently observed that neck pain impairs function in people who use computers frequently. Over 50% of office professionals have experienced the onset or



continuation of neck pain at some point. (4–6) According to the International Association for the Study of Pain, “neck pain can originate from any location within the area that is bounded laterally by sagittal planes tangential to the lateral borders of the neck, superiorly by the superior nuchal line, and inferiorly by an imaginary transverse line through the tip of the first thoracic spinous process.”

According to reports, 288.7 million episodes of neck pain were reported worldwide in 2017. In terms of one's general health as well as personal health, neck pain has been and continues to be a significant public health issue. (7) According to the Global Burden of Disease 2010 Study, neck pain ranks 21st overall and 4th in terms of YLDs, a measure of disability. (8) Due to their ease of accessibility and personalization, therapy interventions involving digital technology have shown to have good potential as technology advances. According to a recent Accenture study, the use of digital technology in healthcare has been steadily rising annually. The market is seeing a rise in the use of mHealth apps, with nearly half (48%) of healthcare consumers utilising this type of app. (9–11)

Mobile health, or mHealth, is defined as "medical and public health practice supported by mobile devices, such as mobile phones, patient monitoring devices, personal digital assistants (PDAs), and other wireless devices," by the World Health Organization's (WHO) Global Observatory for eHealth (GOe). (12,13)

A shift is also evident in healthcare management, as mobile-based digital technology is being used more frequently for patient-centred training, lifestyle monitoring, and symptom assessment. It's likely that this will usher in a new era in healthcare administration. One area of mHealth that is predicted to grow is mobile-based health apps. (14,15) Despite this, it has been discovered that a small number of mHealth mobile applications have scientific backing for their use. The goal of the study was to evaluate the effectiveness of a physiotherapy application for neck pain that was developed and is based on Android.

2. Methods

Following institutional ethics committee approval, the trial was prospectively registered with India's CTRI/2022/01/039216 Clinical Trial Registry. A single-

arm prospective interventional study design was used for the study. Version 3 of Open Epi, was used to calculate the sample size with a 50% expected prevalence rate among office professionals between 18–59 years of age, 10% absolute precision, 95% confidence level, and a 5% significance. A minimum estimated sample size of 107 people was used considering the addition of a ten percent attrition rate. Digital flyers on various social media platforms and groups were used to invite participants to the study. The application "Align - Physio care at your space and time: Neck module"© was also available for download and use on the Google Play Store. (link of the application:

<https://play.google.com/store/apps/details?id=com.align.pt>). Each person who downloaded the app provided permission to use it on their phone and to use it to participate in the study. (16)

Using preregistration questions from the mobile application, participants were screened. Male and female office workers with neck pain between the ages of 18 and 59 were included. People who had a history of hospitalization within the previous six months, neck pain of traumatic origin, headaches, giddiness, or upper extremity numbness or weakness were not included. Individuals who failed to meet the eligibility requirements were notified through a pop-up alert on their mobile devices and were prohibited from using the application further.

Those who met the requirements for inclusion logged in to complete the application. They underwent assessments for every outcome measure both before and right after the two-week intervention; Numerical Pain Rating Scale, (17–19) Neck Disability Index, (19,20) Postural Awareness Scale (21) and Positive Functioning Inventory (22) via the mobile application. After that, they had access to the intervention protocol that had been created. In order to target the multiple impairment areas that contribute to cervical pain in office professionals, the intervention protocol that was designed included exercises that focused on relaxation/breathing, mobility, muscle performance, postural, and oculomotor exercises. Based on the initial pain level as measured by the Numerical Pain Rating, three sets of the Intervention Protocol were created. namely set 1 severe pain; score on NPRS 7-10, set 2 moderate pain; score on NPRS 4-6 and set 3 mild pain; score on NPRS 0-3. Real-time watch-along exercise videos that were specifically made



for the mobile application were used to administer the intervention protocol. A total of 12 sessions, or one session every day for two weeks for six days a week, were administered during the intervention (Figure 1). Through the mobile application, people also received a notification reminding them to do self-exercise sessions. People were only allowed to attend one session per day, and they couldn't go to the next one until the previous one had ended. People could use the extra application features, which included progress tracking, information centre access, physiotherapist contact, and more. (14,16) Individuals were reassessed via the mobile application for all outcome measures upon successfully completing 12 sessions. Analysis was done on data that was determined to be complete in each of the aforementioned aspects (Figure 2).

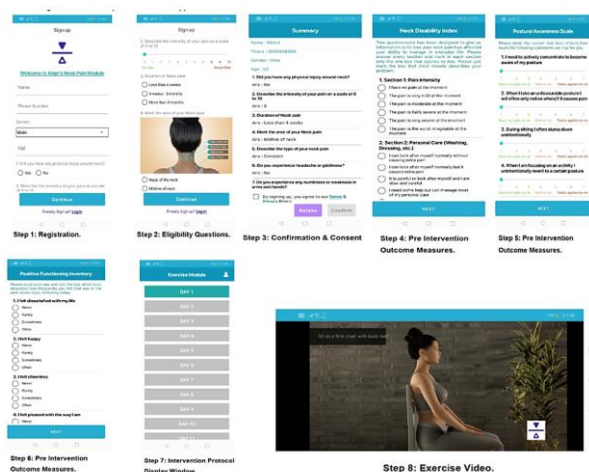


Fig 1: Application Use Flow Process.

3. Results

IBM Corp., SPSS Version 25.0 was utilized for conducting statistical analysis. The P-value of less than 0.05 was deemed statistically significant. Analysis was done on 107 user records in total. There were 46 females and 61 males in the sample population, with a mean age of 35.60 (± 9.70) years. The baseline demographic and neck pain characteristics of the study population are described below in Table 1. A decrease in the Numerical Pain Rating Scale scores ($p < 0.0001$) indicated a significant reduction in neck pain among participants who used the mobile application. The Neck Disability Index score showed a significant improvement as well,

dropping by 4 points ($p < 0.0001$) after utilizing the mobile application. Participants also demonstrated higher Positive Functioning Inventory and Postural Awareness Scale ($p < 0.0001$). The pre- and post-intervention analyses are detailed in Table 2.

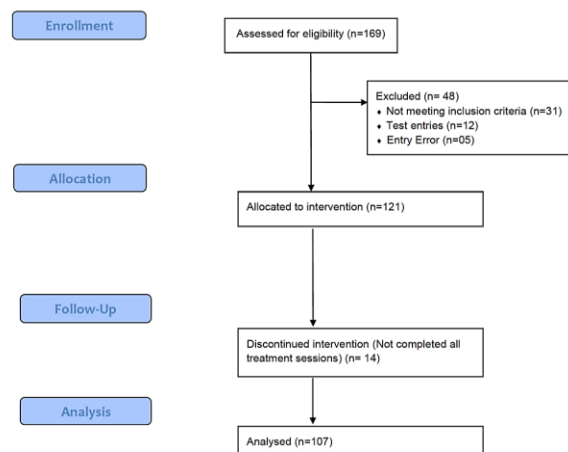


Fig 2: Participants Enrolment and Participation Flow Diagram.

Table 1: Demographic and Neck Pain Baseline Characteristics of Study Population.

| Variable | (N= 107) |
|---|----------------------|
| Age (years) | 35.60 (± 9.50) |
| Gender | |
| Females | 46(43.00%) |
| Males | 61(57.00%) |
| Work/ day (Hours) | 8.83 (± 1.98) |
| Screen Time/ Day (Hours) | 6.37 (± 2.73) |
| Neck Pain Area | |
| Base | 43 (40.18%) |
| Midline | 15 (14.01%) |
| Side | 36 (33.64%) |
| Nape | 13 (12.14%) |
| Duration of Neck Pain | |
| < 4 weeks | 72 (67.28%) |
| 4 weeks – 3 months | 12 (11.21%) |
| > 3 months | 23 (21.49%) |
| Neck Pain Intensity on NPRS | 3.63 (± 1.86) |
| Pain Type | |
| Constant | 36 (33.64%) |
| Intermittent | 65 (60.74%) |
| Growing | 6 (5.60%) |
| Note: Values are mean (\pm standard deviation), number of subjects (%) | |

**Table 2:** Analysis of the Outcome Measures Pre & Post Intervention.

| Outcome Measure | (N= 107) Pre-Intervention Mean \pm SD | (N= 107) Post-Intervention Mean \pm SD | Paired t-Tests |
|------------------|---|--|---------------------|
| NPRS | 3.92 \pm 1.88 | 1.09 \pm 1.26 | p <0.0001 |
| NDI | 7.57 \pm 5.39 | 3.19 \pm 3.60 | p <0.0001 |
| PAS Score | 46.38 \pm 12.17 | 60.45 \pm 12.09 | p <0.0001 |
| PFI Score | 27.20 \pm 5.78 | 28.78 \pm 5.72 | p <0.0001 |

4. Discussion

The purpose of this study was to assess the efficacy of an Android mobile application designed to treat neck pain through physiotherapy, for office professionals. (16) Thereby providing evidence-based support for the development of applications rather than just a theoretical framework. The application that was created includes a specifically created intervention protocol for managing neck pain in office workers. The intervention protocol was developed using evidence-based practices, taking into account multiple factors linked to neck pain in office professionals. (4,6,23–27). According to the biopsychosocial model, impairments in physical, psychological, and social functioning are associated with musculoskeletal pain. (28) Numerous physical job-related exposures, such as poor ergonomic positioning, high physical strain, frequent physical activity, and deficiencies in cervico-scapular strength, mobility, and endurance, have been related to neck pain. (23,28,29) A multifaceted exercise program including motor control, flexibility, and strengthening exercises that are customized to each person's needs is recommended by the Cochrane Review (30). Our intervention protocol was tailored to the individual's baseline pain levels and included a series of progressive exercises like breathing exercises, mobility exercises, muscle performance exercises, postural correction, and oculomotor exercises, that addressed various problem areas contributing to neck pain. (6,23,31–33)

Along with the creation of the mobile application, the study further innovated the intervention protocol's delivery method. The exercises came with written and audio instructions in an animated video that was specially made for the application. The videos were made in a way that allowed them to play continuously for the allotted amount of time and repetitions for each intervention exercise. As a result, while the patients

worked out, they could continuously watch the exercise video. Additionally, the patients received reminders to exercise on their phones through the application. Patients could only view the next exercise session after finishing the previous one. The application was also used to record the person's pain level prior to each session.

The study's main findings include an overall reduction in pain and neck disability after using the mobile application. A positive correlation between pain reduction and neck disability index was seen, along with improved posture awareness, and a higher level of positive functioning. The present study is one of the few that looked into the viability of developing a mobile-based physiotherapy application for the treatment of neck pain. Numerous guidelines and reviews have suggested that maintaining consistency in treatment along with increased adherence to exercise regimens is essential for the effective management of neck and back pain. (30,34) The app's daily reminder function might have kept users motivated to follow through on their exercise regimens. It has been proposed that one effective tactic for increasing program adherence when working out at home is to use technology to send alerts, messages, and reminders. (35) The specifically created range of progressive exercises, which target multiple problem areas leading to neck pain, were easily performed in an office setting because they could be done in either a sitting or standing position. The application that was created made this possible. One possible explanation for the statistically significant change in the study population's outcome measures could have been the implementation of a systematic intervention protocol based on the biopsychosocial model.

5. Limitations

This is one of the few mobile apps created with the use of physiotherapist support throughout the application's use and evidence-based treatment protocols. This pilot



study's main objective was to assess how users saw the benefits of the system in question. Because this is a single-group study without a control group and it depends on self-reported subjective data, results interpretation should be done with caution. It makes sense to assume that users had adhered to the mobile app's therapeutic regimen. Healthcare research frequently uses self-reported data on healthcare utilization. (36) Although recall bias may be present in self-reported data, a study examining the consistency between administrative records and self-reported healthcare service utilization found that there was good consistency between the two. (37)

6. Conclusion

This study validates the efficacy of a self-administered mobile application that combines outcome-oriented and evidence-based exercise prescriptions as a valuable tool for reducing computer users' neck pain and discomfort. Additionally, the intervention shows a significant improvement in functional ability, which improves the general quality of their daily activities. In the context of modern medicine, Align - Physio care at your space and Time: Neck module presents a unique and all-inclusive solution to problems like time constraints that impede visits to physiotherapy centres, potential compromises to the quality of working hours, and logistical challenges faced by professionals.

Acknowledgements

Incredibly appreciative to have worked on the design and development of the mobile application with Mr. Mehul Ranpara, a software engineer, and Mr. Parth Soni, a 3D generalist, without whose assistance this application development would not have been possible. Dr. Dheeraj Kalra for his statistical knowledge.

Declarations

Funding

Many thanks to Student Start-up and Innovation Policy (SSIP 1.0) launched by the Government of Gujarat and RK University's KS Patel Center of Entrepreneurship for providing funding support for the application's development.

Additional Information

The application is protected by copyright all intervention details, requirements, and development processes for mobile applications have been kept confidential. The corresponding author can be contacted for any necessary information that falls within the scope.

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