Journal for Re Attach Therapy and Developmental Diversities
eISSN: 2589-7799
2023 August; 6 (1): 440-449

Effectiveness of Mobile-based Physiotherapy Application in Managing Neck Pain

Mugdha D. Oberoi[1], Priyanshu V. Rathod[2]

[1]Ph.D. Scholar, School of Physiotherapy, RK University, Rajkot, Gujrat. Assistant Professor Kinesiotherapy and Physical Diagnosis. K J Somaiya College of Physiotherapy, Sion, Mumbai.
mugdhaoberoi@gmail.com

[2] Ph.D. Director Internal Quality Assurance Cell,Dean, Faculty of Medicine, School of Physiotherapy, RK University, Rajkot, Gujrat.
priyanshu.rathod@rku.ac.in

Received: 24- June -2023
Revised: 27- July -2023
Accepted: 21- August -2023

Abstract

Background: Neck pain is becoming a major public health issue, with an increase in the burden of health expenses both in terms of personal health and well-being. Office professionals are identified as a specific population at high risk of developing neck pain, with one-year prevalence rates much higher than in the general population. Self-care is essential in today's overspeeding lifestyle. Healthy coping mechanisms are needed to have a balanced personal and professional life. There is a need to incorporate patient-centred and patient-driven care. Mobile application in healthcare management is an emerging healthcare innovation. Its functionality strongly impacts assessing symptoms, lifestyle monitoring, administering treatment programs, and clinical and administrative data collection. The potential of mHealth to reach anytime anywhere surpassing geographical and temporal barriers making it a preferred choice of healthcare delivery mode among patients and healthcare professionals. However, only a few mobile applications in healthcare management have scientific evidence.

Objectives: The aim of this study was to test the efficacy of the developed mobile-based Physiotherapy application for neck pain in office professionals.

Methodology: An experimental descriptive study, where volunteers were selected based on selection criteria, Office professionals with neck pain of non-traumatic origin, and age between 18 to 59 years both male and female. They were assessed for outcome measures and subsequently received the designed intervention protocol through the mobile application. Total 12 sessions for 2 weeks.

Results: Participants who used the mobile application reported a significant reduction in neck pain, as showed by a decrease in the Numerical Pain Rating Scale scores ($p<0.0001$). There was also a notable improvement in the Neck Disability score, with a 4-point reduction ($p<0.0001$). Additionally, participants showed improved Postural Awareness and Positive Functioning Inventory scores ($p<0.0001$).

Conclusion: This study proves the positive effect of the developed mobile-based physiotherapy application for neck pain. The promising results suggest the need for further investigations, including randomized controlled trials, to explore the effectiveness of mobile applications compared to routine clinical care.

Keywords: mHealth, eHealth, tele-rehab, Physiotherapy, Android Application, Neck Pain, Align, workplace-based, Office Workers.

1. Introduction

The evolution of information technology, in the last few decades has brought about a dramatic change globally. (1,2) Self-care, general well-being and mental well-being have become essential for improving the sustainability and productivity of any individual.

Technology advancements and digitalisation have drastically increased screen time be it computer use, tablets or mobile phones. Digital screen in some form or another other has become a part of everyday routine. This has brought about changes in work organization, everyday activities, and professional and social interaction which constantly challenges an individual's physical and mental potential. Neck pain is commonly reported to (3) limit

function (4–8) in individuals with intensive use of computers. (3,9) At some point in time, more than half of office professionals report the emergence or persistence of neck pain. (10)

Neck pain as given by the International Association for the Study of Pain is defined as "pain perceived as arising from anywhere within the region bounded superiorly by the superior nuchal line, inferiorly by an imaginary transverse line through the tip of 1st thoracic spinous process and laterally by sagittal planes tangential to the lateral borders of neck".

Globally the number of prevalent cases of neck pain was reported to hit 288.7 million in 2017. Neck pain has been and becoming a major public health problem, both in terms of personal health and overall well-being. (11) As stated in the Global Burden of Disease 2010 Study, neck pain ranks 4th highest in terms of disability as measured by YLDs, and 21st in terms of overall burden. (12)

With growing technological advancements, therapy interventions involving digital technology have shown to have good potential as they have an ease of accessibility and personalization. In a recent study by Accenture, there has been a constant increase in the use of digital technology for health care every year. mHealth apps are becoming a popular category of mobile applications in the market with nearly half (48%) of healthcare consumers using mHealth apps. (13–15)

World Health Organization's (WHO) Global Observatory for eHealth (GOe) defines mHealth or mobile health 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." (16)

Healthcare management is also showing a changing trend as there has been an increase in the use of mobile-based digital technology for assessing symptoms, lifestyle monitoring and providing patient-centred training. This is probably leading to a new era of healthcare management. Mobile-based health apps are seen to become an emerging field of mHealth. (17) Having said this however every few mHealth mobile applications have been found to have scientific evidence for their use. The present study was conducted to test the efficacy of the developed android-based Physiotherapy application for Neck Pain.

2. Methods

Post approval from the Institutional Ethics Committee, the trial was prospectively registered with the Clinical Trial Registry – India CTRI/2022/01/039216. The Study design adopted was a single-arm prospective interventional study design. The sample size was calculated using Open Epi, Version 3, with the anticipated prevalence of neck pain in Office professionals (age group: 18-59 years) as 50%, absolute Precision of 10%, confidence level of 95% and level of significance at 5%. Keeping in account the attrition rate of 10%. the minimum sample size estimated was 107 individuals. Participants were invited to the study using digital flyers on various social media platforms and groups, the application "Align - Physio care at your space and Time: Neck module"©, was also available on Google Play Store for download and use (link of the application: https://play.google.com/store/apps/details?id=com.align.pt). All individuals who downloaded the application gave consent for using the mobile application and their participation in the study via the application. (18)

Participants were screened using preregistration questions via the mobile application. Office professionals between the age of 18-59 years with neck pain, both males and females were included. Individuals with neck pain of traumatic origin/ associated with numbness or weakness in upper extremities, headache or Giddiness and a history of hospitalization in the last 6 months were excluded. Those who did not fulfil the inclusion criteria received an alert popup message on their mobile screen and were not allowed to proceed further with the use of the application.

Those who fulfilled the inclusion criteria proceeded to log in for the application. They were assessed for all the outcome measures pre and immediately post 2 weeks intervention; Numerical Pain Rating Scale, (19–21) Neck Disability Index, (21–23) Postural Awareness Scale (24) and Positive Functioning Inventory (25) via the mobile application. They then received access to the designed intervention protocol. The designed intervention protocol included exercises focusing on Relaxation/ Breathing exercises, Mobility exercises, Muscle Performance exercises, Postural exercises and Oculomotor exercises thus, targeting multi-impairment areas responsible for

neck pain in office professionals. Intervention Protocol was categorized into three sets according to the baseline pain intensity on the Numerical Pain Rating Scale namely set 1; 7-10, set 2; 4-6 and set 3; 0-3. Intervention protocol was administered via the mobile application in the form of real-time watch-along exercise videos specially created for the mobile application. Intervention was given for 1 session per day for 2 weeks for 6 days a week summing to a total of 12 sessions (Figure 1). Individuals also received a reminder for self-exercise sessions twice a day on their phones as a notification via the mobile application. Individuals could access to only 1 session per day and were not given access to the next session unless the previous session was fully completed (Figure 2). The additional application features of contacting the Physiotherapist, progress tracking, information centre, and more were open for individuals to access. (18) On successful completion of 12 sessions individuals were re-assessed for all the outcome measures via the mobile application. Data which was found to be complete in all the above aspects was considered for analysis.

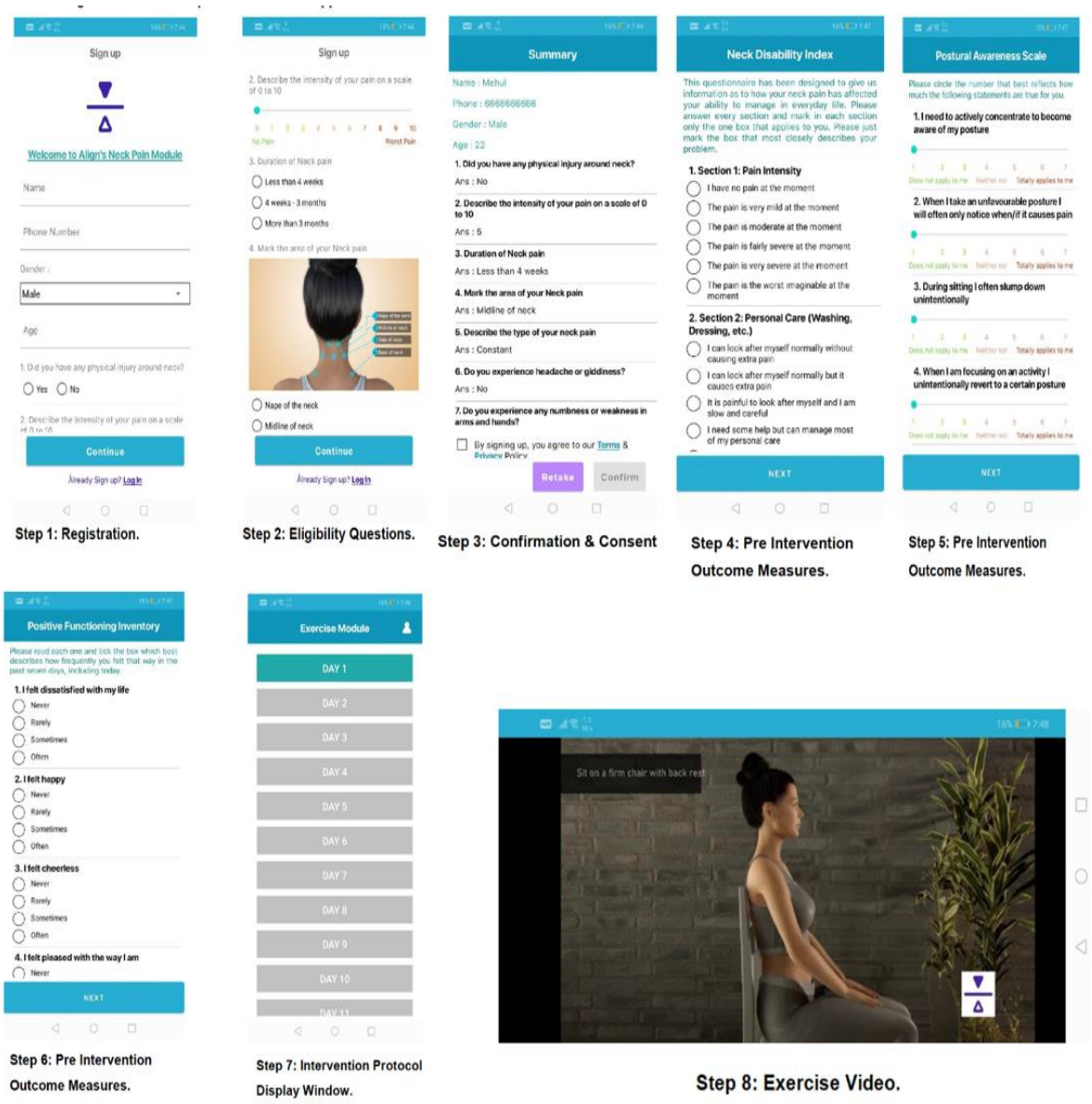

Figure 1: Step-wise Flow Process of Using the Application.

(Source: Self-developed)

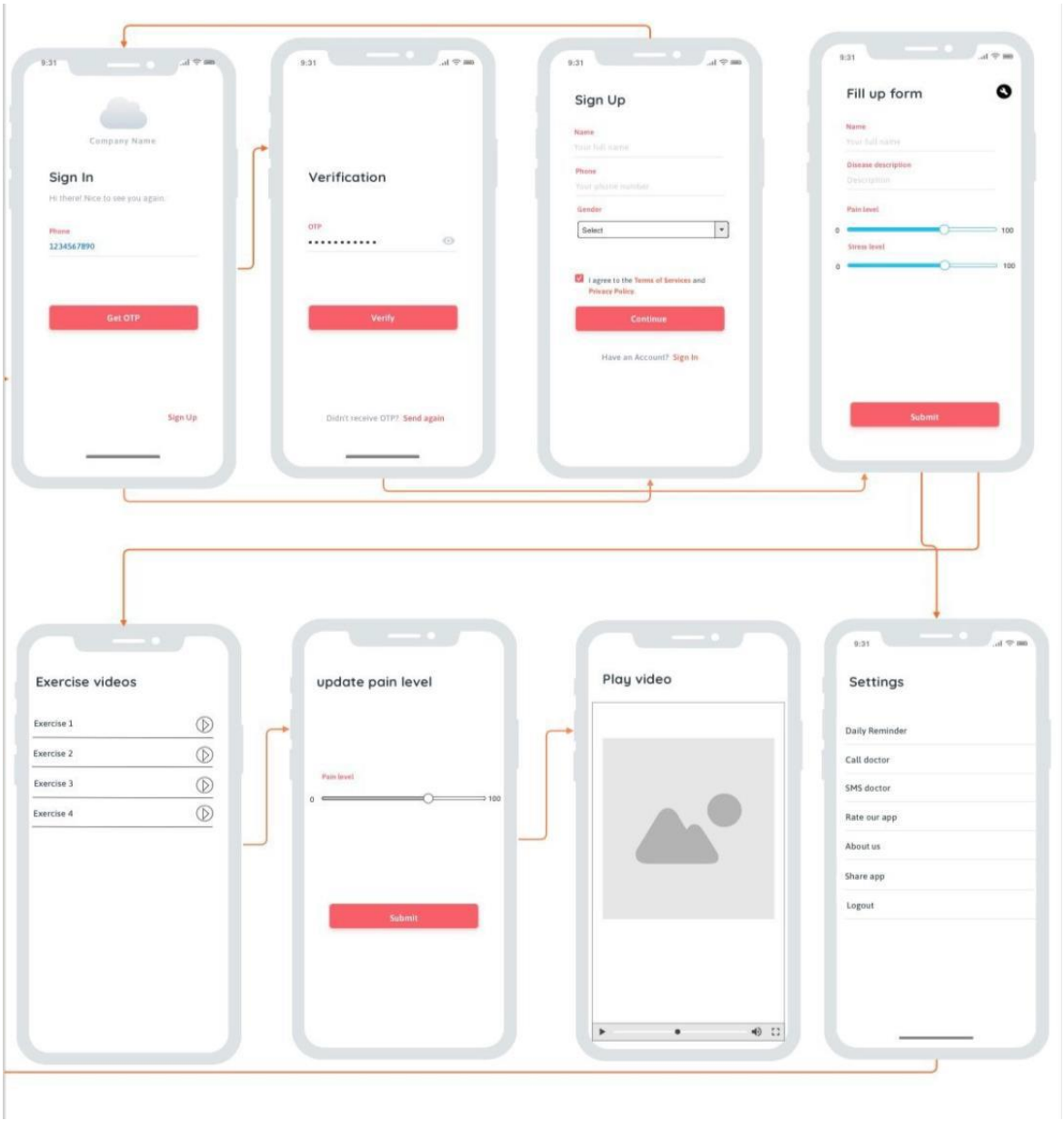

Figure 2: Flow Process of the Application.

(Source: Self-developed)

3. Results

Statistical Analysis was performed using SPSS Version 25.0. (IBM Corp. Armonk, NY: IBM Corp.) P value ≤ 0.05 was considered statistically significant. A total of 107 user data was analysed. The sample population included 61 males and 46 females with a mean age of 35.6 (± 9.7) years. Table 1 and table 2 describe the baseline characteristics of the study population. Participants who used the mobile application reported a significant reduction in neck pain, as showed by a decrease in the Numerical Pain Rating Scale scores ($p<0.0001$). There was also a notable improvement in the Neck Disability score, with a 4-point reduction after using the mobile application ($p<0.0001$). Additionally, participants showed improved Postural Awareness and Positive Functioning Inventory scores ($p<0.0001$). Table 3 elaborates the pre & post intervention analysis of the outcome measures.

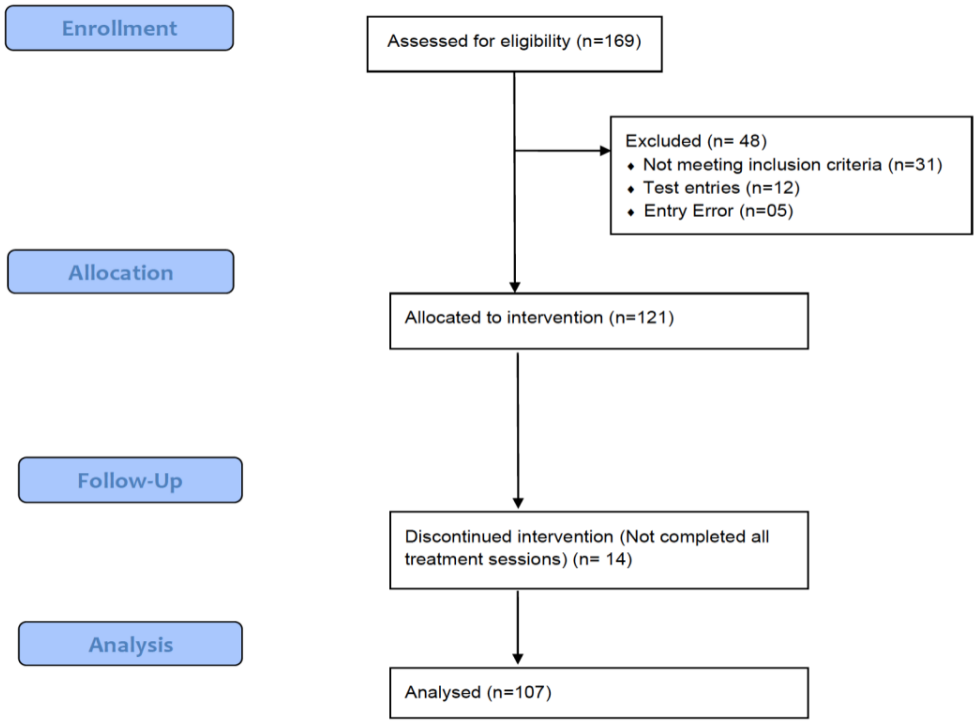

Figure 3: Participants Flow Diagram.

(Source: Self-developed)

Table 1: Baseline Characteristics of Study Population (Demographics)

Variable	(N= 107)
Age (years)	35.6 (± 9.5)
Gender	
Females	46 (42.99%)
Males	61 (57.00%)
Hours of Work/ day	8.83 (± 1.98)
Hours of Computer Screen Time/ Day	6.37 (± 2.73)
Note: Values are mean (± standard deviation), number of subjects (%)	

(Source: Self-developed)

Table 2: Baseline Characteristics of Study Population (Neck Pain Characteristics)

Area of Neck Pain	
Base of Neck	43 (40.18%)
Midline of Neck	15 (14.01%)
Side of Neck	36 (33.64%)
Nape of Neck	13 (12.14%)

Intensity of Neck Pain on the Numerical Pain Rating Scale	3.63 (± 1.86)
Duration of Neck Pain	
Less than 4 weeks	72 (67.28%)
4 weeks – 3 months	12 (11.21%)
More than 3 months	23 (21.49%)
Type of Pain	
Constant	36 (33.64%)
Intermittent	65 (60.74%)
Growing	6 (5.60%)

Note: Values are mean (± standard deviation), number of subjects (%)

(Source: Self-developed)

Table 3: Pre & Post Intervention Analysis of the Outcome Measures.

Outcome Measure	**Pre-Intervention (N= 107)** Mean ± SD	**Post-Intervention (N= 107)** Mean ± SD	**Paired t-Tests**
Numerical Pain Rating Scale	3.92 ± 1.88	1.09 ± 1.26	**p <0.0001** Extremely Significant (rs= 0.72)
Neck Disability Index	7.57 ± 5.39	3.19 ± 3.60	**p <0.0001** Extremely Significant (rs= 0.86)
Postural Assessment Scale Score	46.38 ± 12.17	60.45 ± 12.09	**p <0.0001** Extremely Significant (rs= 0.84)
Positive Functioning Inventory Score	27.20 ± 5.78	28.78 ± 5.72	**p <0.0001** Extremely Significant (rs= 0.91)

(Source: Self-developed)

4. Discussion

This study intended to test the efficacy of the developed android mobile based application to deliver Physiotherapy care for neck pain mainly in office professionals (18). Thus, backing the development of application with an evidence-based support and not merely theoretical support framework. The developed application features specially designed intervention protocol for neck pain management in office professionals. The development of the intervention protocol was evidence based which considered various factors that are associated with neck pain in office professionals (4,9,26–29). Keeping in line with the biopsychosocial model, musculoskeletal pain involves impairments of physical, psychological, and social functioning (30). Various physical job-related exposures such as poor ergonomic positioning, high physical strain, routine physical activity, and impairments in cervico-scapular strength, mobility, and endurance have been associated with neck pain. (26,30) Cochrane Review (31) suggests the need to incorporate a multidimensional exercise program incorporating motor control, flexibility, and strengthening exercises which should be tailored to individual needs (31). Our intervention protocol incorporated a range of progressive exercises targeting multiple problem areas leading to neck pain and

was categorised according to the pain levels of an individual. The designed intervention focused on Breathing exercises, Mobility Exercises, Muscle Performance Exercises, Postural correction and Oculomotor exercises thus targeting multi-impairment areas responsible for neck pain in office professionals. (9,26,27,32,33)

The study further innovated the delivery mode of intervention protocol via the developed mobile-based application. The exercises were available on application in specially created animated video with auditory and written instructions. The videos were created in such a way that they continuously played for the prescribed number of repetitions and time for each exercise of the intervention. Thus, the patients could watch the exercise video continuously as they were exercising. Also, the patients received exercise reminders on their mobile phone via the application patients were permitted to view the next exercise session only when they completed the previous session. Before every session, the pain intensity of the individual was also recorded through the application.

The main findings which can be brought to light from this study were reporting of overall reduction in pain level and neck disability after using the mobile application, positive correlation noted between the decrease in the pain levels and neck disability index, improved awareness of their posture and level of positive functioning. There was a Only a few studies have investigated the feasibility of a developed mobile-based Physiotherapy application for the management of neck pain present study is one among those few studies. Consistency in treatment with increased adherence to exercises has been recommended as a core component in the management of neck back pain by several guidelines and reviews. (34) The daily reminder feature of the application may have contributed towards keeping the users motivated towards continuing their exercises. The use of technologies in the form of alerts, messages, and reminders has been suggested to be a motivating strategy to increase adherence to a home exercise program. (35) The developed mobile application incorporated a specially designed range of progressive exercises targeting multiple problem areas leading to neck pain which were convenient to perform in the office environment as the exercises were designed to be done in either sitting or standing. A structured intervention protocol created for the application based on the biopsychosocial model could have played a key role in demonstrating a clinically important difference in the outcome measures of the study population.

5. Limitations

This is among the few mobile-based application developed with evidence-based treatment protocols and the involvement of Physiotherapist assistance at any time during the use of the application. The primary goal of this preliminary study was to evaluate the perceived benefits of such a system by its users. The results reported must be viewed cautiously due to the limitations of being a single-group study with no control which relies on self-reported subjective data. It is reasonable to believe that users had followed the therapeutic program provided by the mobile app. Self-reported data on healthcare utilization are commonly used in healthcare research.(36) Self-reported data may be associated with recall bias; however, a study that investigated the agreement between self-reported healthcare service usage and administrative records indicated good agreement between the two.(37)

6. Conclusion

The use of the developed mobile application Align - Physio care at your space and Time: Neck module” © by office professionals with neck pain resulted in reduced pain ratings and disability associated with neck pain, as well as increased postural awareness and positive functioning. The user-friendly application has been scientifically proven to be an effective mobile-based application for physiotherapy, providing care conveniently in the individual's own space and time. It opens future opportunities to test such applications in a randomized control trial design and how it compares with routine clinical care.

7. Acknowledgements

Extremely grateful to have collaborated with Mr. Mehul Ranpara, Software Engineer and Mr. Parth Soni 3D Generalist in designing and creating the mobile application without which this application development would not have materialized. Many Thanks to the KS Patel Centre of Entrepreneurship at RK University and the Student Start-up and Innovation Policy (SSIP) scheme for their funding support in developing the application.

8. Additional Information

Complete intervention details and mobile application development requirements and development processes have been kept undisclosed in view of the copyright protection of the application. Necessary details within the scope can be requested from the corresponding author.

References

1. Das Gupta M, Engelman R, Levy J, Luchsinger G, Merrick T, Rosen JE, et al. The State of World Population 2014 RESEARCHERS AND AUTHORS Other contributions from Sarah Castle UNFPA ADVISORY TEAM. 2014.
2. Chadda RK. Youth & mental health: Challenges ahead. Vol. 148, Indian Journal of Medical Research. 2018. p. 359–61.
3. Côté P, Yang X, Kristman V, Hogg-Johnson S, Van Eerd D, Rezai M, et al. The association between workers' compensation claims involving neck pain and future health care utilization: A population-based cohort study. J Occup Rehabil [Internet]. 2013 Dec 23 [cited 2023 Oct 7];23(4):547–56. Available from: https://link.springer.com/article/10.1007/s10926-012-9415-8
4. Carroll LJ, Hogg-Johnson S, Côté P, van der Velde G, Holm LW, Carragee EJ, et al. Course and Prognostic Factors for Neck Pain in Workers. European Spine Journal [Internet]. 2008 Apr 4;17(S1):93–100. Available from: moz-extension://953aa94e-3070-493a-bc61-ae596c468dd8/enhanced-reader.html?openApp&pdf=http%3A%2F%2Fwww.jcda.or.jp%2FPortals%2F0%2Fresource%2Fcenter%2Fshuppan%2Fb_chakushokuhou.pdf
5. Mugdha O, Dhara JK, Sujata Y. ASSESSMENT AND COMPARISION OF CERVICAL JOINT POSITION SENSE IN SUBJECTS WITH CHRONIC NECK PAIN vs NORMALS. International Journal of Physiotherapy [Internet]. 2015 Jun 7 [cited 2023 Jul 30];2(3):483–6. Available from: https://www.ijphy.com/index.php/journal/article/view/80
6. Jossy J, Oberoi M. Postural Awareness and Neck Pain in Individuals using Computer at Work. International Journal of Research in Engineering, IT and Social Sciences [Internet]. 2021 [cited 2023 Jul 30];11:8–11. Available from: http://indusedu.org
7. Gada J, Oberoi M. Impact of Smartphone Addiction on Cervical Pain, Cervical Lordosis and Pectoralis Minor Muscle in Young Adults. International Journal of Research in Engineering, IT and Social Sciences [Internet]. 2018 [cited 2023 Jul 30];08. Available from: http://indusedu.org
8. Punmiya A, Oberoi M. Influence of Smartphone Addiction Grade on Cervical Pain in Young Adults. International Journal of Research in Engineering, IT and Social Sciences [Internet]. 2018 [cited 2023 Jul 30];08:17–9. Available from: http://indusedu.org
9. Cagnie B, Danneels L, Van Tiggelen D, De Loose V, Cambier D. Individual and work related risk factors for neck pain among office workers: A cross sectional study. European Spine Journal. 2007;16(5):679–86.
10. Binder A. Musculoskeletal disorders Neck pain Search date May 2007 Musculoskeletal disorders Neck pain. Clin Evid. 2008;08(1103):1–34.
11. Safiri S, Kolahi AA, Hoy D, Buchbinder R, Mansournia MA, Bettampadi D, et al. Global, regional, and national burden of neck pain in the general population, 1990-2017: Systematic analysis of the Global Burden of Disease Study 2017. The BMJ. 2020;368.
12. GSK. Global Pain Index 2017 Research Report. Global Report Findings. 2017;1–49.
13. Accenture. 2018 Consumer Survey on Digital Health Summary [Internet]. Accenture Consulting. 2018. p. 1–17. Available from: https://www.accenture.com/_acnmedia/pdf-71/accenture-health-2018-consumer-survey-digital-health.pdf#zoom=50 Last Accessed: 06/04/20
14. Jodhpura H, Rathod PV, Rathod P. Impact of Telephysiotherapy to Deliver Physioyoga for Improving the Functional Ability and Pain in the Neck and Shoulder. Study to evaluate acute effects of Sudarshankriya Yoga on physical and functional outcome View project Ph.D Project View project Impact of Telephysiotherapy to Deliver Physioyoga for Improving the Functional Ability and Pain in the Neck and Shoulder. Article in Journal of Yoga & Physical Therapy [Internet]. 2021 [cited 2023 Jul 27];11(7):366. Available from: https://www.researchgate.net/publication/363839193

15. Rathod P, Thumar PB. Telehealth : Management of Functional Disabilities of Computer Users. Natl J Integr Res Med [Internet]. 2019 May 1 [cited 2023 Jul 27];10(2):6–11. Available from: http://nicpd.ac.in/ojs-/index.php/njirm/article/view/2518
16. WHO. mHealth: New horizons for health through mobile technologies [Internet]. Vol. 3, Observatory. 2011 [cited 2020 Aug 5]. Available from: http://www.who.int/about/
17. Oberoi M, Rathod P. mHealth in Physical Therapy Practice: What Consumers Want? Asian Pacific Journal of Health Sciences [Internet]. 2022 Jun 25;9(4):7–10. Available from: https://www.apjhs.com/index.php/apjhs/article/view/2730
18. Oberoi Mugdha, Rathod Priyanshu. 2nd International Healthcare Mgt Conferece 22-Abstract Proceedings. In: Basargekar Prema, editor. Conference Proceedings for 2nd International Healthcare Management Conference 2022. Mumbai: Perfect Solutions & Stationary; 2022. p. 72–6.
19. Salaffi F, Stancati A, Silvestri CA, Ciapetti A, Grassi W. Minimal clinically important changes in chronic musculoskeletal pain intensity measured on a numerical rating scale. European Journal of Pain. 2004 Aug 1;8(4):283–91.
20. Farrar JT, Young JP, LaMoreaux L, Werth JL, Poole RM. Clinical importance of changes in chronic pain intensity measured on an 11-point numerical pain rating scale. Pain [Internet]. 2001 [cited 2023 May 22];94(2):149–58. Available from: https://pubmed.ncbi.nlm.nih.gov/11690728/
21. Pool JJM, Ostelo RWJG, Hoving JL, Bouter LM, De Vet HCW. Minimal clinically important change of the neck disability index and the numerical rating scale for patients with neck pain. Spine (Phila Pa 1976) [Internet]. 2007 Dec [cited 2023 May 22];32(26):3047–51. Available from: https://journals.lww.com/spinejournal/Fulltext/2007/12150/Minimal_Clinically_Important_Change_of_the_Neck.19.aspx
22. Vernon H. The Neck Disability Index: State-of-the-Art, 1991-2008. J Manipulative Physiol Ther. 2008 Sep 1;31(7):491–502.
23. Macdelilld JC, Walton DM, Avery S, Blanchard A, Etruw E, Mcalpine C, et al. Measurement properties of the neck disability index: A systematic review. Journal of Orthopaedic and Sports Physical Therapy [Internet]. 2009 [cited 2023 May 22];39(5):400–16. Available from: www.jospt.org
24. Colgan DD, Green K, Eddy A, Brems C, Sherman KJ, Cramer H, et al. Translation, Cross-Cultural Adaptation, and Psychometric Validation of the English Version of the Postural Awareness Scale. Pain Medicine [Internet]. 2021 Nov 26 [cited 2023 May 22];22(11):2686–99. Available from: https://academic.oup.com/painmedicine/article/22/11/2686/6317530
25. Joseph S, Maltby J. Positive functioning inventory: initial validation of a 12-item self-report measure of well-being. 2014 [cited 2023 May 22]; Available from: http://www.psywb.com/content/4/1/15
26. Ariëns GAM, Van Mechelen W, Bongers PM, Bouter LM, Van Der Wal G. Physical risk factors for neck pain. Scand J Work Environ Health. 2000;26(1):7–19.
27. Ehsani F, Mosallanezhad Z, Vahedi G. The Prevalence, Risk Factors and Consequences of Neck Pain in Office Employees. Middle East Journal of Rehabilitation and Health. 2017;4(2).
28. Eltayeb S, Staal JB, Hassan A, De Bie RA. Work related risk factors for neck, shoulder and arms complaints: A cohort study among Dutch computer office workers. J Occup Rehabil. 2009;19(4):315–22.
29. Andersen JH, Fallentin N, Thomsen JF, Mikkelsen S. Risk factors for neck and upper extremity disorders among computers users and the effect of interventions: An overview of systematic reviews. PLoS One. 2011;6(5).
30. Sahrmann SA. Movement System Impairment Syndromes of the Extremities, Cervical and Thoracic spines [Internet]. 2011 [cited 2021 Aug 18]. Available from: https://books.google.co.in/books?hl=en&lr=&id=hAZT-VFiTUoC&oi=fnd&pg=PP1&dq=Sahrmann+S.+Movement+System+Impairment+Syndromes+of+the+Extremities,+Cervical+and+Thoracic+Spines+2010+Elsevier+Health+Sciences+&ots=Kx1xCEvPzZ&sig=LYN1UdjRPzYThS7vUjiiD76dg4Q&red
31. Geneen LJ, Moore RA, Clarke C, Martin D, Colvin LA, Smith BH. Physical activity and exercise for chronic pain in adults: an overview of Cochrane Reviews. Cochrane Database Syst Rev [Internet]. 2017 Apr 24 [cited 2023 May 11];2017(4). Available from: /pmc/articles/PMC5461882/

32. Chen X, Coombes BK, Sjøgaard G, Jun D, O'Leary S, Johnston V. Workplace-based interventions for neck pain in office workers: Systematic review and meta-analysis. Phys Ther. 2018;98(1):40–62.
33. Shahidi B, Curran-Everett D, Maluf KS. Psychosocial, Physical, and Neurophysiological Risk Factors for Chronic Neck Pain: A Prospective Inception Cohort Study. Journal of Pain [Internet]. 2015;16(12):1288–99. Available from: http://dx.doi.org/10.1016/j.jpain.2015.09.002
34. Gross AR, Paquin JP, Dupont G, Blanchette S, Lalonde P, Cristie T, et al. Exercises for mechanical neck disorders: A Cochrane review update. Man Ther. 2016 Aug 1;24:25–45.
35. Cunningham C, Malone S. Use of a smartphone app to improve adherence among low back pain group: A pilot RCT. Musculoskelet Sci Pract. 2017 Apr 1;28:e18.
36. Bhandari A, Wagner T. Self-Reported Utilization of Health Care Services: Improving Measurement and Accuracy. http://dx.doi.org/101177/1077558705285298 [Internet]. 2006 Apr 1 [cited 2023 May 11];63(2):217–35. Available from: https://journals.sagepub.com/doi/10.1177/1077558705285298?url_ver=Z39.88-2003&rfr_id=ori%3Arid%3Acrossref.org&rfr_dat=cr_pub++0pubmed
37. Carroll M, Sutherland G, Kemp-Casey A, Kinner SA. Agreement between self-reported healthcare service use and administrative records in a longitudinal study of adults recently released from prison. Health Justice. 2016 Dec 1;4(1).