Digital Therapy for a Personalized Approach to Chronic Back Pain

Suchitra Kataria[1] and Vinod Ravindran[2,3]

1. Melange Communications Pte Ltd, Singapore, Singapore; 2. Centre for Rheumatology, Calicut, Kerala, India; 3. Kasturba Medical College, Manipal Academy of Higher Education, Manipal, India

Chronic back pain, defined as back pain lasting for 3 months or more, is the most common pain condition globally. For patients living in diverse settings with varied access to healthcare, digital health technologies could prove useful in providing a personalized touch and expanding avenues for potential holistic care. In this editorial, we have briefly appraised some of the currently available digital therapies.

Keywords

Chronic back pain, digital therapy, mHealth, personalized care, real world, telemedicine, virtual reality

Disclosures: Suchitra Kataria and Vinod Ravindran have no financial or non-financial relationships or activities to declare in relation to this article.

Review process: Double-blind peer review.

Compliance with ethics: This article is an opinion piece and does not report on new clinical data, or any studies with human or animal subjects performed by any of the authors.

Data availability: Data sharing is not applicable to this article as no datasets were generated or analyzed during the writing of this article.

Authorship: The named authors meet the International Committee of Medical Journal Editors (ICMJE) criteria for authorship of this manuscript, take responsibility for the integrity of the work as a whole and have given the final approval for the version to be published.

Received: 15 September 2023

Accepted: 8 November 2023

Published online: 20 February 2024

Citation: *touchREVIEWS in RMD.* 2024;3(1):Online ahead of journal publication

Corresponding author: Dr. Vinod Ravindran, Centre for Rheumatology, Calicut 673009, Kerala, India. E: drvinod12@gmail.com

Support: No funding was received in the publication of this article.

Chronic back pain (CBP), defined as back pain lasting for 3 months or more, is the most common pain condition globally.[1] Greater healthcare utilization, productivity limitations and poor quality of life have immediate and long-term impacts on patients and the healthcare system.[2] The guidelines recommend physiotherapy as a frontline intervention, alongside education and behavioural interventions.[3]

For patients living in diverse settings with varied access to healthcare, digital technologies could prove useful in providing a personalized touch and expanding avenues for potential holistic care.

Digital therapies for chronic back pain

A multimodal, 12-week digital care programme for 6,468 patients with CBP, involving disease education, sensor-guided exercise therapy and behavioural health support with personalized virtual health coaching, showed promising results in diverse real-world settings.[4] Sixty-eight per cent (4,431 out of a total of 6,468) of patients demonstrated improvement in visual analogue scale pain between baseline and 12 weeks. Some of the available digital technologies have been briefly appraised below.

Mobile health

The path to personalized treatment starts with obtaining more granular data related to diseases in real-life settings from individual patients.[5] The data sources could be many and require correlation with physical signs and symptoms. Besides electronic health records, a disease management application (app) or online form reporting outcomes, diurnal variations in symptoms, gender- and age-specific physical activities and mental health status could paint a larger picture of patients presenting with CBP symptoms.

Self-management mobile health (mHealth), comprising educational, physical and psychological interventions, forms the basis of multidisciplinary pain treatment (MPT) programmes. In a meta-analysis of nine studies with 792 participants, Chen et al. showed that disability (mean difference -1.54, 95% confidence interval [CI] -2.35 to -0.73; p<0.001) and pain intensity (mean difference -0.85, 95% CI -1.29 to -0.40; p<0.001) decreased when mHealth and routine care solutions were applied simultaneously compared with usual care alone in patients with CBP.[6] *Table 1* lists different types of mHealth applications, along with their published evidence of varying degrees of efficacy.[7–12]

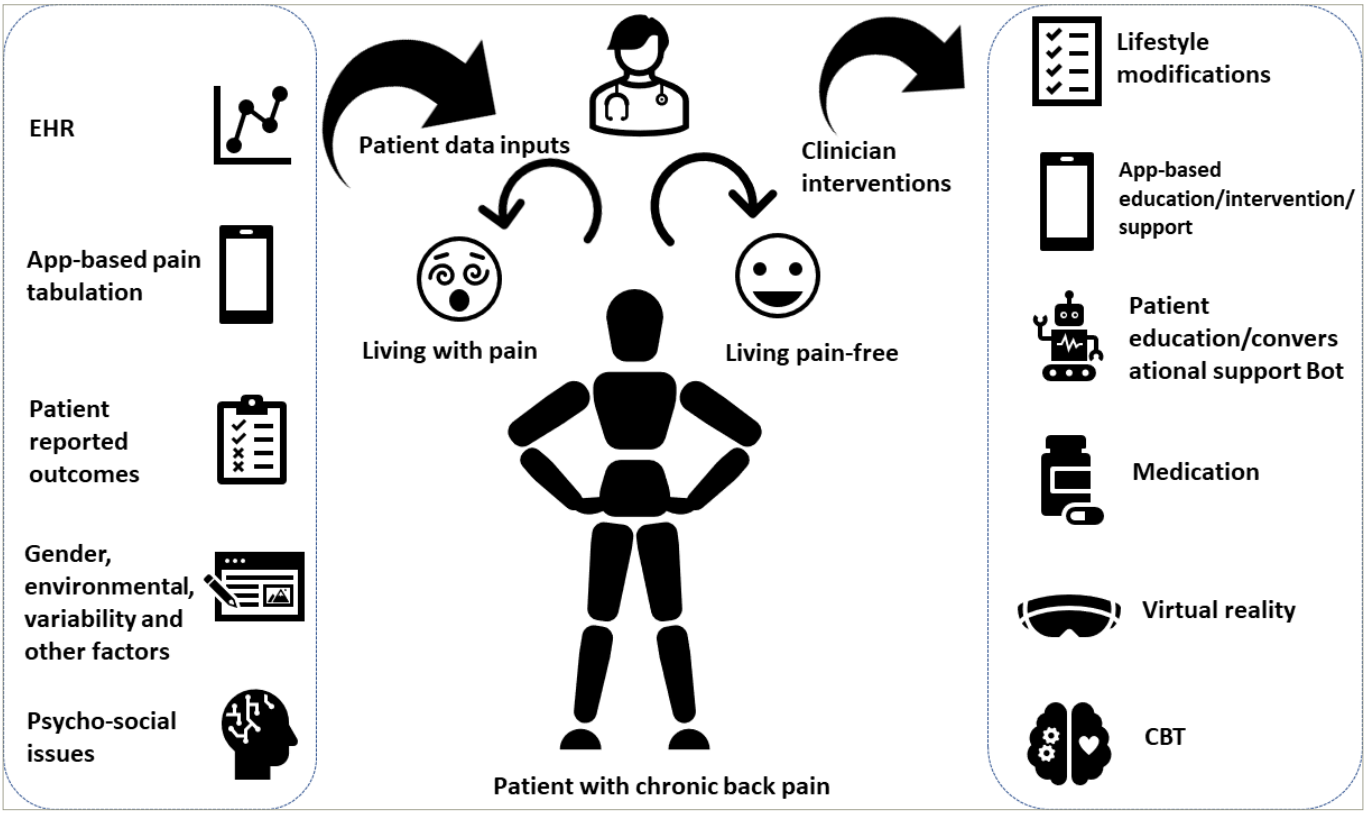
The selfBACK application provides weekly tailored self-management plans, targeting physical activity, strength and flexibility exercises and education for its users.[13] The self-management objectives are achieved by creating case-based reasoning to obtain and repurpose insights from earlier successful cases. A single-arm pilot study enrolled 51 patients seeking help (physiotherapy, chiropractic or general practice) for CBP within the past 8 weeks. The primary outcome, disability, was measured using the Roland-Morris Disability Questionnaire (RMDQ).[14] This scale assessed low back pain-related self-rated physical disability. At the 6-week follow-up, there was a notable improvement in the RMDQ scores (change in score -1.8, 95% CI -0.7 to -2.9).[13] This pilot study was followed by a multinational randomized controlled trial (RCT) with

Table 1: Mobile health applications for chronic back pain with published evidence[7–12]

mHealth application	Key attributes	Advantages	Reference
Pain Coach (PainCoach Inc, Nova Scotia, Canada)	Self-management and assessment, activity tracker and nudges for exercise/behavioural modifications, etc.	Pain reduction and self-management	Hogan et al.[7]
Well Health (Invitrace Company Ltd, Bankok, Thailand)	Artificial intelligence and gamification	Pain reduction and self-management	Lo et al.[8]
selfBack (SelfBACK, Denmark)	Personalization, education, scheduling and nudges for exercise/behavioural modifications, etc.	Pain reduction and recovery	Sandal et al.[9]
ACBSC (Not yet available on market)	Exercise and education	Self-management	Mbada et al.[10]
PainNavigator (PainNavigator Inc, Chicago, USA)	Education, target setting, self-management and assessment	Self-management	Browne et al.[11]
Kaia (Kaia Health Software GmbH, Munich, Germany)	Education, scheduling/nudges for exercise/behavioural modifications, etc.	Pain reduction	Huber et al.[12]

ACBSC = animated cartoon-based self-care; mHealth = mobile health.

Figure 1: Personalized approach to the management of chronic back pain based on short- and long-term patient data from various sources, enabling clinicians to devise customized interventions



CBT = Cognitive Behavioural Therapy; EHR = Electronic Health Record

a two-arm design, investigating the effectiveness of the app in a care-seeking CBP population. This study confirmed the utility of the selfBack intervention.[9]

The Kaia App is an mHealth app adopting a comprehensive evidence-based MPT programme for non-specific low back pain in accordance with current international disease management guidelines.[15,16] Efficacy of the app was assessed through an RCT on 101 adult patients. The control group received online education and six physiotherapy sessions over 6 weeks. The intervention group used the Kaia App for 3 months. At the 12-week follow-up, the Kaia App group reported significantly lower pain intensity compared with the control group (2.70 ± 1.51 versus 3.40 ± 1.63, p<0.01), underscoring superiority of the Kaia App compared to physiotherapy and online education.[17]

Telemedicine

Prescription exercises at home for chronic pain are becoming a viable and cost-effective alternative to reduce healthcare costs. Telemedicine interventions for back pain, such as health education and goal setting, have gained acceptance since the COVID-19 pandemic-enforced restrictions on travel and related logistics.[18]

Virtual reality

Pain education and cognitive behavioural therapy (CBT) are useful approaches for the management of chronic pain.[19,20] Immersive technologies such as virtual reality (VR) could be a potential approach to provide behavioural therapeutics for CBP. One hundred and seventy-nine adults (females: 76.5% and Caucasian: 90.5%) with CBP were enrolled

and randomized to two daily VR programmes, EaseVRx (a VR programme with immersive pain relief skills) or a Sham VR (2-dimensional content delivered via a VR headset) for 56 days.[21] EaseVRx was superior to Sham VR for all primary outcomes, i.e., change in average pain intensity and pain-related interference with activity, stress, mood and sleep. High rates of engagement and user satisfaction were found with EaseVRx, which could be an effective home-based, on-demand, nonpharmacological treatment for complex CBP.[21]

Another study termed VARIETY (Virtual reality integrated within physiotherapy for patients with complex chronic low back pain; ClinicalTrials.gov identifier: NCT05701891) is underway to test the utility of integrated physiotherapy with VR for patients with CBP.[22,23] In this two-arm study, the cost-effectiveness of physiotherapy with integrated, immersive multimodal (pain education, activation, relaxation and distraction) VR is being compared with the usual primary physiotherapy care. Instead of providing VR as a stand-alone treatment, this pragmatic trial will ensure VR integration by physiotherapists while treating the patients. Multimodal VR interventions can be tailored to individual needs, and hence, provide a personalized approach to treatment. The efficacy and outcomes are expected to be robust due to the thorough monitoring of patients and their treatment, which includes five measurements over a follow-up period of 12 months.[22]

Conclusion

In conclusion, we emphasize that the aforementioned digital technologies are expected to provide a more data-driven and personalized approach to managing CBP. The evidence for generation and adoption of these technologies is still a work in progress. We anticipate that VR technologies will become mainstream in the coming years and create wide-r anging options for delivering CBT, rehabilitation exercises and remote coaching to patients with CBP virtually, in a more cost-effective and patient-friendly manner. In *Figure 1*, we have summarized a digital model that outlines a personalized approach for the management of CBP based on short- and long-term data from patients, enabling clinicians to intervene in a customized manner in real-world settings. ❑

1. GBD 2021 Low Back Pain Collaborators. Global, regional, and national burden of low back pain, 1990-2020, its attributable risk factors, and projections to 2050: a systematic analysis of the global burden of disease study 2021. *Lancet Rheumatol*. 2023;5:e316–29. DOI: 10.1016/S2665-9913(23)00098-X.
2. Hartvigsen J, Hancock MJ, Kongsted A, et al. What low back pain is and why we need to pay attention. *Lancet*. 2018;391:2356–67. DOI: 10.1016/S0140-6736(18)30480-X.
3. Foster NE, Anema JR, Cherkin D, et al. Prevention and treatment of low back pain: Evidence, challenges, and promising directions. *Lancet*. 2018;391:2368–83. DOI: 10.1016/S0140-6736(18)30489-6.
4. Bailey JF, Agarwal V, Zheng P, et al. Digital care for chronic musculoskeletal pain: 10,000 participant longitudinal cohort study. *J Med Internet Res*. 2020;22:e18250. DOI: 10.2196/18250.
5. Kataria S, Ravindran V. Harnessing of real world data and real world evidence using digital tools: Utility and potential models in rheumatology practice. *Rheumatology (Oxford)*. 2022;61:502–13. DOI: 10.1093/rheumatology/keab674.
6. Chen M, Wu T, Lv M, et al. Efficacy of mobile health in patients with low back pain: Systematic review and meta-analysis of randomized controlled trials. *JMIR Mhealth Uhealth*. 2021;9:e26095. DOI: 10.2196/26095.
7. Hogan TP, Etingen B, McMahon N, et al. Understanding adoption and preliminary effectiveness of a mobile app for chronic pain management among US military veterans: Pre-post mixed methods evaluation. *JMIR Form Res*. 2022;6:e33716. DOI: 10.2196/33716.
8. Lo WLA, Lei D, Li L, et al. The perceived benefits of an artificial intelligence–embedded mobile app implementing evidence-based guidelines for the self-management of chronic neck and back pain: Observational study. *JMIR Mhealth Uhealth*. 2018;6:e198. DOI: 10.2196/mhealth.8127.
9. Sandal LF, Bach K, Øverås CK, et al. Effectiveness of app-delivered, tailored self-management support for adults with lower back pain-related disability: A selfBACK randomized clinical trial. *JAMA Intern Med*. 2021;181:1288–96. DOI: 10.1001/jamainternmed.2021.4097.
10. Mbada CE, Isatayo TS, Omole JO, et al. Development and feasibility testing of an animated cartoon-based self-care application for low-back pain – A pilot study. *Med Rehabil*. 2021;25. DOI: 10.5604/01.3001.0015.2527.
11. Browne JD, Vaninetti M, Giard D, et al. An evaluation of a mobile app for chronic low back pain management: Prospective pilot study. *JMIR Form Res*. 2022;6:e40869. DOI: 10.2196/40869.
12. Huber S, Priebe JA, Baumann K-M, et al. Treatment of low back pain with a digital multidisciplinary pain treatment app: Short-term results. *JMIR Rehabil Assist Technol*. 2017;4:e11. DOI: 10.2196/rehab.9032.
13. Sandal LF, Øverås CK, Nordstoga AL, et al. A digital decision support system (selfBACK) for improved self-management of low back pain: A pilot study with 6-week follow-up. *Pilot Feasibility Stud*. 2020;6:72. DOI: 10.1186/s40814-020-00604-2.
14. Roland M, Morris R. A study of the natural history of back pain. part I: development of a reliable and sensitive measure of disability in low-back pain. *Spine (Phila Pa 1976)*. 1983;8:141–4. DOI: 10.1097/00007632-198303000-00004.
15. Bernstein IA, Malik Q, Carville S, Ward S. Low back pain and sciatica: Summary of NICE guidance. *BMJ*. 2017;356:i6748. DOI: 10.1136/bmj.i6748.
16. Qaseem A, Wilt TJ, McLean RM, et al. Noninvasive treatments for acute, subacute, and chronic low back pain: A clinical practice guideline from the American College of Physicians. *Ann Intern Med*. 2017;166:514–30. DOI: 10.7326/M16-2367.
17. Toelle TR, Utpadel-Fischler DA, Haas KK, Priebe JA. App-based multidisciplinary back pain treatment versus combined physiotherapy plus online education: A randomized controlled trial. *NPJ Digit Med*. 2019;2:34. DOI: 10.1038/s41746-019-0109-x.
18. Dario AB, Moreti Cabral A, Almeida L, et al. Effectiveness of telehealth-based interventions in the management of non-specific low back pain: A systematic review with meta-analysis. *Spine J*. 2017;17:1342–51. DOI: 10.1016/j.spinee.2017.04.008.
19. Rosser BA, Fisher E, Janjua S, et al. Psychological therapies delivered remotely for the management of chronic pain (excluding headache) in adults. *Cochrane Database Syst Rev*. 2023;8:CD013863. DOI: 10.1002/14651858.CD013863.pub2.
20. Skelly AC, Chou R, Dettori JR. Noninvasive nonpharmacological treatment for chronic pain: A systematic review. In: *Comparative Effectiveness Review, No. 209*. Agency for Healthcare Research and Quality (US), 2018;18–EHC013. DOI: 10.23970/AHRQEPCCER209.
21. Garcia LM, Birckhead BJ, Krishnamurthy P, et al. An 8-week self-administered at-home behavioural skills-based virtual reality program for chronic low back pain. *J Med Internet Res*. 2021;23. DOI: 10.2196/26292.
22. Slatman S, Ostelo R, van Goor H, et al. Physiotherapy with integrated virtual reality for patients with complex chronic low back pain: Protocol for a pragmatic cluster randomized controlled trial (VARIETY study). *BMC Musculoskelet Disord*. 2023;24:132. DOI: 10.1186/s12891-023-06232-0.
23. ClinicalTrials.gov. Virtual Reality Integrated Within Physiotherapy for Patients With Complex Chronic Low Back Pain (VARIETY). ClinicalTrials.gov identifier: NCT05701891. Available at: https://classic.clinicaltrials.gov/ct2/show/NCT05701891 (Date last accessed: 31 January 2024).