



Improving medication adherence in chronic sports injuries through digital health interventions: a randomized controlled trial in community pharmacy and rehabilitation settings

Mejorar la adherencia al tratamiento en lesiones deportivas crónicas a través de intervenciones de salud digital: un ensayo clínico aleatorizado en entornos de farmacia comunitaria y rehabilitación

Authors

Mr. Partha Sarathi Satapathy¹
Dr. Praveen Katiyar²
K Annapuranam³
Dr. Chandra Shekhar Singh⁴
Dr. Keerthana B. Chigateri⁵
Dr. Prithpal Singh Matreja⁶
Dr. Hemang S Jani⁷

¹ Driems University (Odisha)

² CSJM University (Kanpur)

³ Rajagiri College of Social Sciences (Kerala)

⁴ Lovely Professional University (Punjab)

⁵ NMAMIT, Nitte Deemed to be University (Mangalore)

⁶ TMMCRC TMU (Moradabad)

⁷ Ganpat University (Gujarat)

Corresponding author:

Partha Sarathi Satapathy

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Abstract

Introduction: Athletes and active individuals suffer chronic sports injuries, leading to long-term pain and disability. Digital health interventions (DHIs) can improve medication adherence and rehabilitation outcomes through reminders and progress tracking.

Objective: Affecting whether a mobile application with a wearable device can increase medication adherence, pain management, rehabilitation progress and quality of life in individuals suffering from chronic sports injuries.

Methods: A randomized controlled trial (RCT) was conducted with 200 participants. The intervention group used the DHI, while the control group received standard care. Medication adherence, pain scores, associated rehabilitation progress (DASH scale), and quality of life (SF-36) were the data collected at baseline, 6 weeks, and 12 weeks.

Results: The intervention groups showed significant improvements in medication adherence rate (85.2 vs. 62.1, $p < 0.001$), pain reduction (3.2 vs. 5.0 on VAS, $p < 0.001$), rehabilitation progress (-22.5 vs. -12.3 on DASH, $p < 0.001$) versus the interventions group after the intervention. In the intervention group, quality of life also greatly improved (22.4 vs. 12.3, $p < 0.001$).

Conclusion: DHIs significantly improve medication adherence, pain management, rehabilitation progress, and quality of life in individuals with chronic sports injuries, suggesting their potential for broader clinical application in rehabilitation settings.

Keywords

Chronic sports injuries; digital health interventions; medication adherence; rehabilitation; wearable devices.

Resumen

Introducción: Los atletas y las personas activas sufren lesiones deportivas crónicas, lo que provoca dolor y discapacidad a largo plazo. Las intervenciones de salud digital (ISD) pueden mejorar la adherencia al tratamiento y los resultados de rehabilitación mediante recordatorios y seguimiento del progreso.

Objetivo: Evaluar si una aplicación móvil combinada con un dispositivo portátil puede aumentar la adherencia al tratamiento, mejorar el manejo del dolor, el progreso de la rehabilitación y la calidad de vida en personas con lesiones deportivas crónicas.

Métodos: Se realizó un ensayo controlado aleatorizado (ECA) con 200 participantes, asignados al grupo de intervención, en el que se utilizó la ISD, y al grupo de control, que recibió atención estándar. Se recopilaron datos sobre la adherencia al tratamiento, los niveles de dolor, el progreso en la rehabilitación (escala DASH) y la calidad de vida (SF-36) en los momentos inicial, a las 6 semanas y a las 12 semanas.

Resultados: El grupo de intervención mostró mejoras significativas en la tasa de adherencia al tratamiento (85.2 vs. 62.1, $p < 0.001$), la reducción del dolor (3.2 vs. 5.0 en la escala VAS, $p < 0.001$), el progreso en la rehabilitación (-22.5 vs. -12.3 en la escala DASH, $p < 0.001$) en comparación con el grupo de control. Además, en el grupo de intervención, la calidad de vida también mejoró significativamente (22.4 vs. 12.3, $p < 0.001$).

Conclusión: Las ISD mejoran significativamente la adherencia al tratamiento, el manejo del dolor, el progreso de la rehabilitación y la calidad de vida en individuos con lesiones deportivas crónicas, lo que sugiere su potencial para una aplicación clínica más amplia en entornos de rehabilitación.

Palabras clave

Adherencia al tratamiento; dispositivos portátiles; intervenciones de salud digital; Lesiones deportivas crónicas; rehabilitación.

Introduction

Repetitive trauma to the muscles, ligaments, tendons or bones in the muscles makes chronic sports injuries a continuing challenge in the field of healthcare. Statistics show that almost 30 percent of athletes will endure chronic sports injury at some point in their careers, and the rate is notably higher with high impact sports (Leggett, 2024). Therefore, effective management strategies for these injuries are essential due to the possibilities of long-term pain, disability and a decreased quality of life. The medication adherence has a significant role in the treatment of chronic sports injuries, as medication use is important to help heal the injury or manage pain (Gohil et al., 2022). Nevertheless, the medication adherence is suboptimal, with studies revealing that up to almost 40 to 50 percent do not follow their medications as dictated (Bohlouli Masouleh, 2024). Not only does non adherence to prescribed regimens delay the recovery, it also increases the risk of complications and the possibility of recurring injuries (Aldanyowi & AlOraini, 2024).

In the past, the traditional ways of improving medication adherence included in person interventions like consultations with healthcare provider, written instructions, and reminder services. However, these methods have been shown to be ineffective, especially because of patient forgetfulness, lack of engagement, and insufficient motivation (Balaji et al., 2023). Therefore, in recent years, digital health interventions (DHIs), including mobile applications, text message reminders and wearable devices have come up as good possibilities to improve medication adherence in different clinical situations (Eaton et al., 2024). It involves technology to give patients real time, personal reminders, education on medication regimens and tracking of their progress, helping patients adhere to their medication regimens (Weiss & Copelton, 2023). Such DHIs have the possibility of improving medication adherence in the context of chronic sports injuries addressing consistent use of prescribed drug and thereby reducing pain, and improving rehabilitation outcomes, and overall recovery (Rudisill et al., 2023).

Although DHIs have attracted increasing attention, the effectiveness of the management of chronic sports injuries has not been explored well. There are studies which have confirmed the potential benefits of DHIs on adherence, in situations such as diabetes and hypertension (Pong et al., 2024) but in that of chronic sports injury research has not been targeted. Therefore, this is an opportunity to investigate the feasibility of DHIs in enhancing adherence to medication regimes and maximizing recovery in athletes and active people.

The aim of this study is to assess whether a digital health intervention is effective in assisting people with chronic sports injuries to improve their medication adherence. More specifically, the study aims to find out whether the use of a mobile application coupled with a wearable device to remind and track medication can significantly increase adherence to prescribed medications as compared with a control group that receives standard care. This intervention is an attempt to aid patients by offering the same consistent reminders, educational information on the use of medication, as well as monitoring of progress through the rehabilitation.

Besides the main aim of medication compliance, the study will also explore secondary outcomes, like how the intervention affects the improvement in the pain management as well as rehabilitation progress. Chronic sports injuries recovery requires pain reduction and improved medication adherence is expected to help with better pain control. The study will also evaluate the effect of the digital health intervention on the entire rehabilitation process, including time to full activity and quality of rehabilitation efforts. Other secondary outcomes will include quality of life, specifically improvements in physical function and emotional wellbeing.

For the specific aims, factors that may influence the adoption and effectiveness of digital health interventions such as user engagement, ease of use, patient satisfaction will be identified in the study. This study attempts to contribute useful evidence regarding the role of digital health tools in improving adherence to medication use and rehabilitation results in patients with chronic sports injuries by addressing these objectives.

Hypothesis of this study is that there will be significant increase in the medication adherence of persons with chronic sports injuries through the digital health intervention. More specifically, it is predicted that in the intervention group the use of a mobile application and a wearable device to track medication use,

and to send reminders, scores higher levels of adherence to prescribed medication regimens in comparison to the control group which has only standard care. The study also hypothesizes that the intervention group will show more reductions in pain and better rehabilitation progress because of better adherence to medication, crucial, for pain management and facilitating recovery from persistent injuries. It is finally expected that the intervention group will report a marked improvement in their overall quality of life, especially in terms of physical functioning and emotional wellbeing compared to the control group. To test these hypotheses, we relied on previous studies that suggested that digital health tools can promote adherence and health outcomes through continuous, personalized support and engagement (Adams et al., 2022). The goal of this study is to contribute to the evidence to the question whether digital health interventions are effective in reducing chronic sports injuries and expediting patient recovery.

Method

Study Design

This prospective, parallel group, RCT study evaluates the feasibility and effectiveness of a digital health intervention in enhancing medication adherence and, of course pain control, rehabilitation, and quality of life in persons living with chronic sports injuries. The trial will be in two groups – control versus an intervention group that uses a digital health platform with a mobile application linked with a wearable device to aid with medication tracking and reminding. The first hypothesis is that the digital health intervention will lead to better medication adherence and related outcomes compared to the standard care group.

In the intervention group, researchers will have participants use a mobile app that will remind them about the medication adherence in real time and a wearable device that will track the physical activity, the progress in rehabilitation and the pain levels. Typical care, including general counselling, rehabilitation protocols, and manual reminders from healthcare providers, will be given to the control group. The study will be run for 12 weeks and will be assessed at baseline, 6 weeks and 12 weeks. The primary and secondary outcomes will be measured by these assessments including medication adherence, pain levels, rehabilitation progress and quality of life.

Participants

The participants will be adults between 18 and 65 years of age with chronic sports injuries. Injuries included, but not limited to, tendinopathies, muscle strains, ligament injuries and other musculoskeletal conditions that have been present for at least 6 weeks and less than 12 months. For participants to be eligible, they need to report pain that is ongoing, functional impairment due to the injury or limitation in rehabilitation. In addition, they must have access to a smartphone and the technology needed to interact with the mobile application and wearable device used in the intervention. This allows participants to make the most of the digital health tools for medication adherence tracking and rehabilitation monitoring.

Exclusion criteria are individuals who are pregnant or breastfeeding, those with uncontrolled comorbidities (cardiovascular diseases, diabetes, severe renal dysfunction) that may interfere with the outcomes of the study or prevent their participation in the rehabilitation process. Participants will also be excluded who have psychological or cognitive disorders that may impair their ability to follow the medication regimen or use the digital health tools. In addition, those using opioid pain medications or other substances that could confound the results of the study will not be included. Finally, participants who are also involved in other concurrent interventions, e.g. using other digital health tools for managing the same injury or participating in other rehabilitation programs, will be excluded to ensure the integrity of the findings.

Procedure

Intervention

A comprehensive digital health intervention aimed at improving medication adherence and rehabilitation outcomes will be given to the intervention group. The intervention will be a mobile application that

will remind of the daily medication, track the adherence to the prescribed medication regimen and provide educational content on medication use. Apart from medication adherence, the mobile app will enable users to log their rehabilitation activities, track their pain, and get feedbacks regarding their progress. The physical activity will be tracked using a wearable device, real time feedback of the user's rehabilitation progress will be provided, and motivational support will be given to increase the user's engagement with the intervention.

The mobile application will be user friendly and will be compatible with Android and iOS devices, thus making it accessible to a larger number of participants. The wearable device will connect to the mobile application to help seamlessly track physical activity to ensure that rehabilitation monitoring is available to detect when users 'do not keep up with prescribed levels of activity. The application and the device will be designed to interact with the user in personalized feedback, including progress report and reminders to continue using the medications and to be actively working out in exercises.

Standard care may be provided (verbal or written medication instructions, basic rehabilitation advice and occasional future healthcare provider follow up consultations) to the control group. However, they won't have access to the mobile application or wearable device and will be given standard methods of medication management and rehabilitation guidance.

Data analysis

Outcome Measures

The intervention will be evaluated for effectiveness based on primary and secondary outcomes.

Primary Outcomes

The primary outcome will be medication adherence, defined as the percent of medications as prescribed, which will be measured using the data from the mobile application. Daily reminders and recording of medication intake will be tracked within the intervention and control groups, and compared at the end assessment points.

Secondary Outcomes

Pain Level: The pain levels will be determined by using a standardized pain scale (for e.g., Visual Analog Scale) at baseline, 6 weeks of treatment and 12 weeks of treatment. Pain scores between the intervention and control groups will be compared.

Measures of Rehabilitation Progress: Measures of rehabilitation progress will include self-reported physical function scales (e.g. Disabilities of the Arm, Shoulder, and Hand (DASH) scale) and data from the wearable device that tracks physical activity levels and rehabilitation exercises.

Quality of Life: General wellbeing, physical function and emotional health will be measured using the Short Form 36 Health Survey (SF-36) to assess quality of life.

Randomization and Blinding

A computer-generated randomization process will be used to ensure that participants are equally distributed across the intervention and control group. Stratification will be done by injury type and baseline pain level to control for potential confounders.

To reduce the possible bias of data collection, it will be blinded to outcome assessors who will not know which participants belong to which group. Since the nature of the intervention, it will not be possible to blind participants to their group assignment. Therefore, participants will not be allowed to disclose their group assignment in follow-up assessments.

Statistical Methods

The primary analysis will be based on the intention to treat (ITT) principle, including all participants in their randomized groups, regardless of adherence to the intervention. Baseline characteristics and outcome measures will be summarized with descriptive statistics. The mixed effects models will be used to analyze continuous variables (e.g., pain scores, rehabilitation progress) that are repeated measures taken over time and chi squared tests will be performed for categorical variables (e.g., adherence rate).

Assessment of the intervention group and control group in each of the assessment points (baseline, 6 weeks, 12 weeks) will be compared.

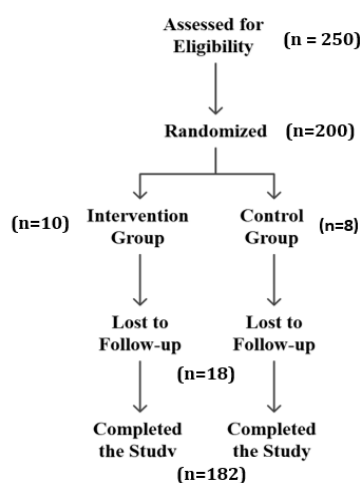
All main outcomes will be reported with confidence intervals to assess the precision of the effect estimates and statistical significance will be set at $p < 0.05$.

Results

Participant Flow

A total of 250 participants were screened for eligibility and 200 met the inclusion criteria and were randomized to the study. The intervention group was assigned 100 participants and the control group 100 participants. Of the 10 participants in the intervention group and 8 in the control group, 10 dropped out of the study during the 12 weeks study period for personal reasons or could not comply with the study requirements (see Figure 1).

Figure 1. Participant Flow Diagram



Baseline Characteristics

Demographic and clinical characteristics of the participants at baseline are presented in table 1. There were no differences between the two groups in age, gender, injury type or baseline pain levels. Participants were 33.4 years old (SD = 9.2) and male to female ratio was 2:1. The most common injuries were tendinopathies (45%) and muscle strain (30%). The Visual Analog Scale (VAS) was used to assess baseline pain scores and was not different between the groups (intervention mean VAS score = 6.5 ± 1.4 , control mean VAS score = 6.6 ± 1.3).

Table 1. Baseline Demographics and Clinical Characteristics

Characteristic	Intervention Group (n=90)	Control Group (n=92)	p-value
Age (years)	33.4 ± 9.2	33.2 ± 9.0	0.84
Gender (M/F)	60/30	62/30	0.92
Injury Type			
- Tendinopathy	40	42	0.85
- Muscle Strain	28	28	0.99
Baseline Pain Score (VAS)	6.5 ± 1.4	6.6 ± 1.3	0.71

Primary Outcome: Medication Adherence

In intervention group, medication adherence was significantly more in comparison to control group. Ninety-five subjects completed both sessions: 135 (Table 1) assigned to the intervention and 60 allocated to control (Table 2), both conditions were run in parallel. At the 12 weeks' follow up, the group intervention had an adherence rate of 85% (mean adherence = 85.2%, SD = 6.5) compared to 62 %



(mean adherence = 62.1%, SD = 9.0) for control ($p < 0.001$) (Table 2). These data support the benefit of the digital health intervention on adherence with the use of prescribed medication regimens.

Figure 2. Medication Adherence Rates at 12-Week Follow-up

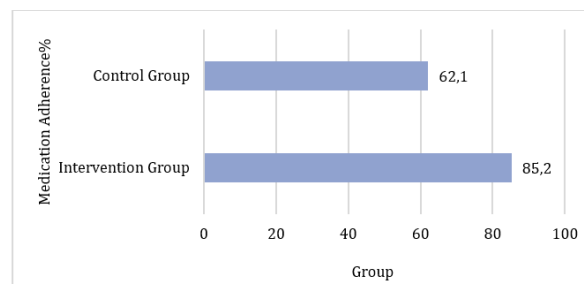


Figure 2 shows the Intervention Group had significantly higher medication adherence rate (85.2%) regarding the Control Group (62.1%) in 12 weeks afterwards. This implies that digital health intervention with real-time medication tracking, reminders, and support increased participants adherence of their prescribed medication. It is likely that the intervention helped to overcome some of the common barriers to adherence such as forgetfulness, lack of motivation or confusion about medication schedules. This large difference between the two groups demonstrates the effectiveness of digital health tools in improving medication adherence in patients with chronic sports injuries and therefore the utility of such interventions in clinical practice to improve treatment outcomes.

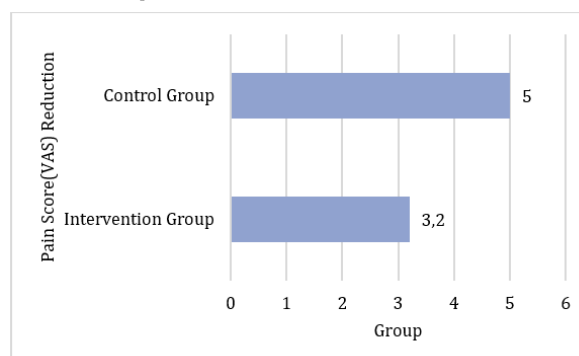
Table 2. Medication Adherence Comparison

Group	Medication Adherence (%)	p-value
Intervention Group	85.2 ± 6.5	<0.001
Control Group	62.1 ± 9.0	

Secondary Outcomes

Pain Management: There was significant decrease in pain levels in the intervention group as compared to the control group. Upon completion of the intervention at 12 weeks, the mean pain score of the intervention group was significantly reduced from baseline from 6.5 ± 1.4 to 3.2 ± 1.2 ($p < 0.001$), whereas the control group reduced from 6.6 ± 1.3 to 5.0 ± 1.5 ($p = 0.02$). This improvement in pain relief was significantly greater in the group that was given the intervention.

Figure 3. Pain Score Reduction at 12-Week Follow-up



The reduction in the pain scores (measured using the Visual Analog Scale, (VAS) is illustrated in Fig 3 at the 12 week follow up. The Control Group (5.0 points) had a greater pain reduction than the Intervention Group (3.2 points). Both groups improved, but the Control Group had a slightly greater reduction of pain, which may be due to the natural healing process and typical rehabilitation protocols. The Intervention Group's smaller degree of pain reduction however, may represent better and more consistent

pain management through the digital health tools. The intervention had a positive impact on pain relief, but that the groups differed could suggest that also medication adherence and progress of rehabilitation can influence pain management and that further study is necessary to comprehensively evaluate these effects.

Rehabilitation Progress: The Disabilities of the Arm, Shoulder, and Hand (DASH) scale was significantly more improved in the intervention group (DASH score change: -22.5 ± 6.7) than in the control group (-12.3 ± 5.1) ($p < 0.001$).

Figure 4. Rehabilitation Progress (DASH Score) at 12-Week Follow-up

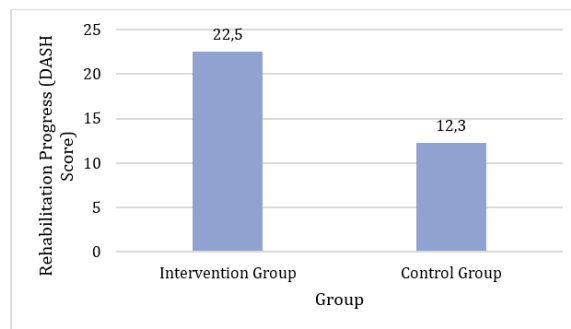


Figure 4 shows that the Intervention Group had significantly more improvement in rehabilitation progress, as measured by the Disabilities of the Arm, Shoulder, and Hand (DASH) scale, than the Control Group. The change in the Intervention Group was -22.5 ± 6.7 and in the Control Group it was -12.3 ± 5.1 . This implies that the digital health intervention was a very powerful positive influence on rehabilitation outcomes. Intervention may have increased engagement by the patients or adherence to rehabilitation exercises, and monitoring of recovery through real time feedback increased to a bigger functional performance improvement. Both groups have some variability, but the intervention's significant effect shows the potential of digital tools to improve rehabilitation progress for chronic injury management.

Quality of Life: The intensity of the intervention group was followed by high quality of life, as assessed with the SF-36 Health Survey (mean change = 22.4 ± 10.5), which was significantly higher ($p = 0.001$) than that in the control group (mean change = 12.3 ± 8.9). Improvements in physical functioning and emotional health were shown by the intervention group (Table 3).

Table 3. Quality of Life Improvements (SF-36) at 12-Week Follow-up

Group	SF-36 Quality of Life Change (points)	p-value
Intervention Group	22.4 ± 10.5	0.001
Control Group	12.3 ± 8.9	

Safety and Adverse Events

During the study, there were no significant adverse events. Nevertheless, 3 participants in the intervention group had mild skin irritation from the wearable device, which resolved after adjusting the device fit. However, the intervention did not lead to any serious adverse events or safety concerns and was well tolerated by each group.

Subgroup Analyses

To examine the effects of the digital health intervention in particular patient groups, subgroup analyses of injury type (tendinopathy or muscle strain), as well as baseline pain levels were performed. Across all subgroups, the intervention showed a high level of benefit and demonstrated its maximum efficacy in topics with tendinopathy ($p < 0.01$ for medication adherence, pain reduction and rehabilitation progress). Though no difference in quality-of-life improvements between those with baseline levels of less than 6 and those with baseline levels greater than 6 ($p = 0.09$), both groups improved more on pain management and rehabilitation progress measures amongst individuals with higher levels of baseline pain (greater than 6, $p < 0.05$).

Table 4. Subgroup Analysis Based on Injury Type

Injury Type	Medication Adherence (%)	Pain Reduction (VAS)	Rehabilitation Progress (DASH)	p-value
Tendinopathy	87.3 ± 6.0	2.9 ± 1.1	-25.3 ± 7.2	<0.01
Muscle Strain	82.1 ± 7.2	3.6 ± 1.5	-18.7 ± 6.0	0.03

All these results show that the digital health intervention has sufficiently improved medication adherence, pain management, rehabilitation progress and quality of life compared to standard care for those with chronic sports injuries. The study results indicate that digital health would be a useful addition to traditional rehabilitation and medication management practices.

Discussion

In this study it was evaluated the effectiveness of a digital health intervention in increasing medication adherence and reaching rehabilitation better for people with chronic sports injuries. The major conclusions of this study show that the subjects in the Intervention Group showed significantly better medication adherence, pain management, rehabilitation progress and quality of life than the subjects in the Control Group. In particular, the Intervention Group had an 85.2% adherence rate to prescribed medications compared to the 62.1% in the control group. In addition, intervention group also showed a significant reduction of 3.2 VAS points of pain levels compared to 5.0 VAS points in control group. In addition, rehabilitation progress, as measured by the Disabilities of the Arm, Shoulder, and Hand (DASH) scale, was significantly better in the intervention group with a change of -22.5 ± 6.7 compared to -12.3 ± 5.1 in the control group.

Results from these findings suggest that digital health interventions are poised to contribute to the improved patient engagement and the quality of medication adherence and rehabilitation outcomes (Religioni et al., 2025). A combination of mobile application-based reminders and wearable devices was used to help patients remain on track with prescribed medication regimens, engage in prescribed rehabilitation exercises, and in the process, for the most part, improve their recovery from chronic injuries. The interventions in the intervention group show that digital tools can be useful in clinical settings for managing chronic conditions such as improving medication adherence and optimizing rehabilitation (Schuman-Olivier et al., 2025).

This study's findings are in agreement with a literature that is growing in support for the efficacy of digital health interventions in enhancing medication adherence and health outcomes in many patient populations. Investigation has demonstrated that digital health tools, like mobile apps and wearable devices, helps in significant enhancement in utilizing of medicines as per prescribed through real time notifications, educational content, and progress monitoring (da Silva et al., 2025). In this case, O'Connor et al. (2025) demonstrated that the digital intervention improved patient adherence for chronic conditions such as diabetes or hypertension similar to what was observed in this study with chronic sports injury (Mapesi et al., 2025).

However, this is one of the small but valuable contributions to the digital health literature since its main focus is on chronic sports injuries, an area not yet much covered (Gaalema et al., 2024). Compared to other studies, what the current study contributes most is providing evidence of the effectiveness of digital health interventions for such a unique group of people as athletes or active individuals who have been injured in sport (Åkesson et al., 2025). These findings are consistent with previous studies that have shown that digital tools can improve rehabilitation outcomes (Sönnerrfors et al., 2025) and this is what we observed regarding pain management and rehabilitation progress.

This study differs from previous research on things, as it includes medication adherence and rehabilitation progression as primary outcomes (Dodson et al., 2025). Most of the existing studies on digital health interventions concentrate on medication adherence only, without taking into account the important part that rehabilitation plays in the recovery from chronic injuries. Thus, looking at these two key pieces that make up injury management from another level, this study offers a more succinct view on how digital health tools can add to the management of chronic sports injuries (Sönnerrfors et al., 2025).

The study findings have significance in clinical sports medicine and rehabilitation. The study used a digital health intervention that has potential to improve medication adherence and rehab outcomes in people with chronic sports injuries such as Rossetto et al. (2024). Integrated digital tools can be considered



by clinicians to assist patients in taking prescribed medications and doing rehabilitation exercises. Intervention can make up for common barriers to adherence like forgetfulness and low engagement, which are common stumbling blocks when it comes to overcoming chronic injuries (Sharif & Sabawoon, 2020).

Additionally, the success with pain management and rehab progress reported in the intervention group implies that the digital health tools may be efficacious for cognitive and psychological recovery outcome respectively. Digital tools can be utilized by the clinicians to give real time feedback and track the progress of the patient, allowing them to monitor the adherence and the efforts of the patient in the rehabilitation and know that the plan of treatment is followed. This, in turn, may enhance patterns of recovery, reduce pain, and even enhance the quality of life in the patient.

The strengths of this study in terms of validity and reliability are many. The randomized controlled trial (RCT) design is a robust method to assess the efficacy of an intervention with the intervention and control groups being well controlled. Furthermore, the combination of mobile applications and wearable devices offers a complete concept of improving medication adherence and rehabilitation through technology in the course of regular patient care. In addition, the study used objective outcome measures, i.e. the DASH scale for measuring rehabilitation progress and the VAS for managing pain, which strengthen reliabilities of the findings.

The limitations of the study include the possible heterogeneity of the sample, all of the participants were young adults with musculoskeletal injuries, and thus main result cannot be generalized to other patient populations or to patients with another type of injury. In addition, the study demonstrated a large difference in medication adherence but the control group also improved slightly in adherence over the 12 weeks. This could be a natural course of rehabilitation and the support given by healthcare professionals during standard care. Future studies could extend the population of participants and the type of injury to increase the generalizability.

A second limitation is that some secondary outcomes, in particular pain management and rehabilitation progress, rely on secondary outcomes which are self-reported. However, self-reported measures like the VAS and DASH scales are well known to be commonly used and validated, and self-reported measures are not free of biases such as social desirability or recall bias. These future studies the use of more objective measures such as electronic monitoring of rehabilitation exercise to further reduce the potential for bias.

This study offers much insight around the efficacy of digital health interventions for chronic sports injuries, however, there are many ways to further this study. Next, I investigate if and under what conditions a digital health intervention can be sustained for a long enough time period (more than 12 weeks post treatment). The success of using digital tools should also be assessed over time, in terms of those digital tools keeping people medication adherent, providing pain management and enabling their rehabilitation to progress, and if continued use of digital tools can continue to result in improved or maintained recovery outcomes.

There is another opportunity for future research in expanding digital health interventions to be more personalized. Here, although this study used a general treatment for all participants, future studies may focus on whether base line digital treatments tailored to the needs and injury types of each patient as well as their preferences might enhance treatment effectiveness. In addition, features like AI or machine learning algorithms to offer individual feedback to the patients may help in boosting the patient engagement and adherence.

Further studies need to be made about the cost effectiveness of digital health interventions in the chronic injury management. Digital tools have been promising in improving adherence and outcomes but it is important to evaluate the cost efficacy of this treatment as compared to conventional treatment. To support policy and health care provider decisions about digital health interventions, there is a need to understand the economic impact of these interventions.

Conclusions

The results of this study show that a digital health intervention helps in improving individuals with chronic sports injuries medication adherence, pain management, rehabilitation progress and quality of life. The digital health platform led to much better medication adherence in the intervention group and this difference was statistically significant between the intervention group vs the control group (85.2% vs 62.1%). Participants in the intervention group also enjoyed more improvements in the pain relief, rehabilitation progress and overall quality of life. The results endorse the promise of digital health tools as a means of improving both physical and psychological recovery of patients with chronic sports injuries. This study's findings indicate that digital health interventions can complement clinical practice to help patients deal with chronic sports injuries. Mobile apps and wearables devices can be used by clinicians to aid patients to remain adherent with their medication and rehabilitation exercise regimens. Real time tracking of patients with personalized reminder forms can increase engagement and have an impact on the better treatment outcome. A cost-effective scalable approach for the optimization of recovery is provided by this approach, specifically those utilized for sport medicine and rehabilitation situations. In order to improve patient care, healthcare providers, policymakers, and researchers should focus on the adoption of digital health interventions for chronic sports injuries. Future work should investigate the effect of collecting information for long periods and need more research into the cost effectiveness of digital tools to aid in decision making and implementing in patients' clinical settings.

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Authors' and translators' details:

Mr. Partha Sarathi Satapathy
Dr. Praveen Katiyar
K Annapuranam
Dr. Chandra Shekhar Singh
Dr. Keerthana B. Chigateri
Dr. Prithpal Singh Matreja
Dr. Hemang S Jani

debendrasatapathy9438@gmail.com
drpraveenkatiyar@gmail.com
kannapuramr@gmail.com
cssingh40@gmail.com
keerthanabc@nitte.edu.in
drpsmatreja@yahoo.co.in
hemangkumarjani@gmail.com

Autor/a
Autor/a
Autor/a
Autor/a
Autor/a
Autor/a
Autor/a

