



Clinical science

Mobile health applications for individuals with psoriatic arthritis

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Abstract

Objectives: Mobile health applications (apps) hold promise as tools for symptom tracking and management of chronic rheumatic diseases such as PsA. Apps for PsA have not been systematically evaluated. We conducted a comprehensive review of apps designed for patients with PsA.

Methods: The iOS and Android app stores were searched using the term 'arthritis' and individual app descriptions were reviewed for 'psoriatic arthritis'. Apps were downloaded and rated using the Mobile Application Rating Scale (MARS). Additionally, the apps were evaluated to determine functionality, use of symptom scales and potential for integration within clinical care.

Results: The search was conducted in spring 2024 and 130 apps were found that mentioned 'arthritis'. Seven had specific mentions of PsA in their description. We found several other relevant apps by following recommendations in the app stores. In total, 10 apps for patients with PsA were identified. MARS scores suggest they were moderate to excellent in quality. The functionality of the 10 apps differed: 7 allowed for symptom tracking, 3 allowed for data export to health records, 2 allowed for medication tracking and 1 contained a patient community platform. The symptom tracking capabilities varied widely and we could find only one published study of any of the apps.

Conclusions: We analysed apps for PsA to identify potential unmet needs and found that there are few publicly available apps, their functionality varies tremendously and testing of these apps is almost non-existent. There appears to be room for improvement of apps for PsA.

Lay Summary

What does this mean for patients?

Mobile health applications (apps) hold promise as tools for symptom tracking and management of chronic rheumatic diseases such as psoriatic arthritis (PsA). Apps for PsA have not been systematically evaluated. We conducted a comprehensive review of apps designed for patients with PsA. We analysed apps for PsA to identify potential unmet needs and found that there are few publicly available apps, their functionality varies tremendously and testing of these apps is almost non-existent. There appears to be room for improvement of apps for PsA.

Keywords: psoriatic arthritis, mobile health application, digital health technology

Key messages

- Mobile health applications (apps) hold promise as tools for symptom tracking and management of chronic rheumatic diseases such as PsA.
- Only 10 apps designed for PsA could be found on publicly available app stores. These apps were rated moderate in quality and were found to be extremely heterogeneous in function.
- Rigorous testing of these apps could not be found in the published literature.

Introduction

The digital health landscape is rapidly changing, with mobile health applications (apps) a potentially important patient-facing tool that has the potential to improve healthcare. It was estimated that ≈80 000 mobile health apps were added to app stores in 2017, with several billion downloads [1]. This likely reflects a trend towards patient interest in taking greater control of their health management [2]. For chronic symptomatic rheumatic diseases like PsA, apps have the

potential to play an important role for patients and their clinicians [3].

To ensure optimal outcomes, patients with PsA require ongoing symptom management and clinical support; these could be improved with the use of apps. Functions that apps could offer include longitudinal symptom tracking, patient education, medication reminders and community engagement [4]. Research in other chronic rheumatic diseases, such as RA, suggests that apps can significantly impact clinical

outcomes and patient empowerment [4]. In RA, systematic reviews of apps suggest the potential for apps to improve symptom management and medication adherence [5]. There has been one prior review of apps focused on spondyloarthritis [6]. With an interest in app development for PsA, we wanted to understand existing apps, their quality and their functionality.

We reviewed apps for PsA in the app stores, aiming to assess their quality and functionality. We had a specific interest in longitudinal symptom tracking and the ability to integrate with clinical care. This review is qualitative in nature, as almost no data evaluating the apps were available.

Methods

PsA app search and selection criteria

A search was conducted on both the iOS and Android app stores using the term ‘arthritis’. The app descriptions were reviewed for specific mentions of PsA and these were downloaded for evaluation. Several more relevant apps were found by implementing a ‘snowball’ approach [7], examining the app store recommendations related to other relevant apps. No human subjects were involved in this research and the human ethics committee was not consulted.

Assessment of PsA apps

Two authors (R.A. and D.H.S.) evaluated all PsA apps identified. First, they used the standardized and validated Mobile Application Rating Scale (MARS) to perform a quality rating [8]. The MARS is a validated tool that has been used broadly to rate the quality of apps across healthcare [9]. The MARS addresses several core app characteristics, such as engagement, functionality, aesthetics and information quality, along with a subjective quality section. Two authors (R.A. and D. H.S.) scored each app independently and their scores were averaged to produce a final MARS rating.

Then they characterized the apps’ basic features, such as the user interface, ease of use, credibility of health information provided and functionality. Aspects of an apps functionality that were assessed, based on our prior reviews of rheumatology apps [5, 10], included longitudinal symptom tracking capability, medication reminders and import/export of data to the electronic health record (EHR). We also noted other app-specific functions such as appointment reminders,

laboratory results, links to informational websites and patient community engagement tools.

For apps that included longitudinal symptom-tracking functions, additional characteristics were examined, including the use of validated symptom scores (e.g. a patient-reported outcome), ability to view symptoms over time and interpretation of symptom scores.

Analysis

Simple proportions were calculated for the app characteristics. No data could be extracted or analysed from the apps. We did not attempt to review articles evaluating the apps, as we found only one.

Results

Our search using keywords related to arthritis and PsA yielded 130 potential apps found in the iOS and/or Android stores. After screening, we identified 10 applications that were explicitly designed for individuals managing PsA. All identified apps were available free of charge.

Table 1 describes basic information about the apps. Most app developers are private for-profit companies. Some seem to produce health apps as a business. Other developers appeared to have rheumatologists as collaborators. The Group for Research and Assessment of Psoriasis and Psoriatic Arthritis (GRAPPA), a collection of academic researchers and clinicians sponsored by the biopharma industry, developed an app that appears to be mostly directed towards researchers. Versus Arthritis, a UK-based charity that supports arthritis care and research, has also developed an app that can be used for PsA. Some of the apps require patient consent and were likely originally developed as part of a study. All of the apps have been developed since 2017, most are focused on adult patients and only one app had >10 reviews on the app stores.

Evaluating the apps using the MARS (see Table 2) demonstrated that they vary widely in mean scores, from 2.8 to 4.6. A total of 80% of the apps have mean scores ≥ 3.6 ; the average overall MARS score was 3.8, suggesting moderate quality. The domains with the lowest mean scores were engagement and information quality.

The functionality of the 10 apps is described in Table 3. Few (3 of 10) apps allowed for data import and/or export into the EHR. Most prompted for input of symptom scores

Table 1. PsA apps and descriptions found in the iOS or Android app stores

App name	Developer	Patient consent required	Approximate year developed	Target age group (years)	Downloads, <i>n</i>	Reviews in app store ^a , <i>n</i>
Psoriasis Point of Care—Psoriasis Manager	@Point of Care	No	2017	≥ 17	>500	3
My Arthritis	Ampersand Health	No	2021	≥ 12	>10	1
GRAPPA App	Unknown	Yes		≥ 17		2
ImmerseRx	Deborah Wood Associates	No	2021	≥ 17	>100	2
Bezyy PsA	Healthline Media	No	2023	≥ 17	>1000	109
Psorcast	Sage Bionetworks	Yes	2022	≥ 12	>100	2
Arthritis+ Patient	Azaya Technologies	Yes	2021	≥ 17	>500	1
ELSA—Your Rheumatic Companion	Elsa Science	Yes	2023	≥ 17	>1000	6
Psoriasis Monitor	RPM Healthcare	Yes	2019	≥ 17	>100	3
Arthritis Tracker	Versus Arthritis	No	2020	≥ 12	>5000	0

Information provided in this table was found in the app stores, except for the number of downloads. Download information came from a proprietary website (<https://www.data.ai/en/insights/topic/reports/>) and should be considered an approximation, as this information is typically private and not verified.

^a Review numbers as of 10 June 2024.

Table 2. MARS scores based on averages from two authors' assessments

Domains	Engagement	Functionality	Aesthetics	Information	Mean score
Psoriasis Point of Care—Psoriasis Manager	4.2	3.9	4.3	3.6	4.0
My Arthritis	3.6	4.5	4.0	3.9	4.4
GRAPPA app	1.8	4.8	3.7	4.1	3.6
ImmerseRx	3.6	4.0	4.3	4.0	3.8
Bezy PsA	4.5	4.5	3.3	3.3	3.9
Psorcast	3.8	4.0	3.5	4.1	4.6
Arthritis+ Patient	3.0	3.5	2.7	3.0	3.1
ELSA—Your Rheumatic Companion	4.5	5.0	4.7	4.0	4.6
Psoriasis Monitor	2.8	3.2	3.2	2.3	2.8
Arthritis Tracker	3.6	4.5	4.0	4.7	4.2
Mean score	3.5	4.2	3.8	3.7	3.8

MARS score range: 1 (inadequate), 2 (poor), 3 (acceptable), 4 (good) and 5 (excellent). There are four domains, each with three to seven items. Typical scores on other health apps are 2.3–4.3 [15–17].

Table 3. PsA app functionality

App	Data import from EHR	Data export to EHR	Input of medication list	Input of clinic appointment dates	Longitudinal symptom scores	Sends reminders for symptom scores (frequency)	Links to external educational sites	Patient community platform
Psoriasis Point of Care—Psoriasis Manager	No	No	Yes	Yes	Yes	Yes ^a	No	No
My Arthritis	Yes	Yes	Yes	Yes	Yes	Yes (daily)	No	No
GRAPPA app	No	No	No	No	No	No	No	No
ImmerseRx	No	No	No	No	No	No	No	No
Bezy PsA	No	No	No	No	No	Yes (weekly)	Yes	Yes
Psorcast	Yes	Yes	No	No	Yes	Yes (weekly)	No	No
Arthritis+ Patient	No	No	No	No	Yes	No	No	No
ELSA—Your Rheumatic Companion	No	No	No	Yes	Yes	Yes (daily)	Yes	No
Psoriasis Monitor	No	No	No	Yes	Yes	No	Yes	No
Arthritis Tracker	No	Yes	No	No	Yes	Yes (daily)	No	No

^a Not functional on version tested by the authors.

and had longitudinal symptom trackers, but few (3 of 10) gave clinicians the ability to view patient symptoms. Only two allowed for patients to import their medication lists and three had links to external educational websites. One app's main function was a patient community platform.

Seven of the apps had longitudinal symptom tracking functions (see Table 4). While many of the apps had similar functions in this regard, some important differences were noted. A few (3 of 10) allowed for free-text (journal) entries. Five used questionnaires to collect symptoms. However, many used items that were not clearly part of a validated questionnaire. Four allowed the user to see results graphically. Most helped users interpret their symptoms.

The last column in Table 4 describes the types of symptoms queried by the seven apps. All seven (100%) asked about general health status and three (43%) asked about mental health status. Five (71%) asked patients to use a joint diagram to describe affected areas and five asked about fatigue. Pain and physical function were each asked by three (43%) of the apps.

Discussion

In this qualitative review, we aimed to systematically assess apps tailored for PsA. All 10 apps we found had patient-facing content. Overall, they rated moderately well on the standardized MARS system. Functionality of the apps was

not standardized. Many focused on symptom monitoring and a few offered other features. Integration with clinical care (i.e. through the patient's EHR) was relatively limited.

Four findings from this review require discussion. First, we were surprised that so few apps had links to educational websites. Other studies have found that patients want access to reliable health information [11]. We anticipated finding that apps would help provide such information through links to reputable websites or education within the app. Given the importance for patients to receive accurate and up-to-date information, this seems like a missed opportunity.

Second, while not obvious from the MARS score (Table 1), only one app had been evaluated in a rigorous study. Across health apps in general, relatively few have been evaluated [12]. Many health apps are developed by non-academic software engineers who may not see the value of rigorous testing leading to published results. However, we know that PsA clinical experts would be more likely to recommend apps that have undergone testing with publication in peer-reviewed journals. The relative paucity of user reviews for these apps was also concerning; this suggests that they are being downloaded but rarely used. We found little assurance on data security in the iOS or Android app stores for any of the apps we reviewed. It is imperative that patient data input into apps be kept in a secure fashion. If data breaches occur, patients will lose confidence with inputting private data into health

Table 4. Characteristics of seven PsA apps with longitudinal symptom tracking

App	Includes free text input (journal)	Data in the form of symptom score questionnaires	Collects symptoms using validated measures	Display results graphically	Longitudinal record of symptoms	Includes interpretation (standardization) of symptom results	Longitudinal symptom scores viewable by clinician	Symptoms queried by each app
Psoriasis Point of Care—Psoriasis Manager	Yes	Yes	Yes	No	No	No	Yes	GH, F, P, PF, JD, MH
My Arthritis	Yes	No	No	Yes	Yes	Yes	No	GH, F, JD, MH
Psorcast	No	No	No	Yes	Yes	Yes	Yes	GH, JD
Arthritis+ Patient	Yes	Yes	Yes	Yes	Yes	Yes	No	GH, F
ELSA—Your Rheumatic Companion	No	Yes	No	No	Yes	Yes	No	GH, F, P
Psoriasis Monitor	No	Yes	No	No	No	Yes	No	GH, F, P, PF, JD, MH
Arthritis Tracker	No	Yes	No	No	No	Yes	No	GH, PF, JD

GH: general health; F: fatigue; P: pain; PF: physical function; JD: joint diagram; MH: mental health.

apps, likely resulting in reduced use. These concerns may also result in healthcare providers and patients losing confidence and motivation to use these apps.

Third, the emphasis on symptom tracking seems quite appropriate and useful for the successful management of PsA. However, the lack of integration of patient symptoms reported through an app into clinical care is another missed opportunity. Clinicians often ask patients about symptoms since their last visit. If the symptom tracking included in the app could be easily shared with the clinician, this could provide useful information for clinical decision-making and visit timing. Better integration of data from the apps into the clinical workflow seems like a missed opportunity. Finally, there is a lack of data from patients regarding what functions apps might serve. We could identify one study that suggests patients prioritize information on laboratory tests, medications and symptoms [13].

We acknowledge certain limitations in our methodology. Our search criteria may have overlooked some apps, particularly those that do not explicitly mention PsA in their descriptions or are listed under broader categories. Additionally, certain apps may require specific clinician involvement for activation. This may have excluded certain apps or certain functions from our review. The utilization of the standardized MARS tool is a strength of this review. In addition, two authors (one a clinician and another not) used the apps independently. We did not include a patient in this review. Additionally, there were almost no data available evaluating the performance of the apps, i.e. patient adherence, patient satisfaction or symptom improvement over time.

Conclusion

This review highlights the emerging role of mobile apps in supporting individuals with PsA, but it also points to significant opportunities for improvement. As the digital health landscape evolves, developers, clinicians and patients must collaborate to ensure that PsA apps meet the highest standards of quality, usability and integration with healthcare systems. This collaborative approach can maximize the potential of mobile health technologies to be developed for clear purposes through user-centred design [14]. Our analysis serves as a first step towards understanding the current state of mobile health applications for PsA. This underscores the necessity for a concerted effort in developing high-quality,

clinically integrated apps capable of advancing PsA management and paving the way for improved patient outcomes.

Data availability

All of the data are presented within this article.

Authors' contributions

R.A.: performed data collection and drafted the manuscript; T.P., J.S. and E.L.: reviewed and gave feedback on the manuscript; D.S.: performed data collection and revised the manuscript.

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