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Usefulness of a hand therapy application



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ABSTRACT

Study Design: Cross-sectional cohort design that collected data by means of a survey.

Introduction: Performance and adherence to a home exercise program (HEP) has been identified as an integral component of hand therapy rehabilitation. Understanding how patients learn along with offering creative options to improve engagement is important. Advancements in technology including the use of smart phone apps should be considered.

Purpose of Study: To determine if a hand therapy app is a useful method for patient education and home exercises for patients receiving hand therapy for an orthopedic injury distal to the shoulder.

Method: Individuals receiving hand therapy at an outpatient hand therapy clinic via a convenience sample ($n = 41$) were asked to download use The Hand Therapy Application for an individualized exercise program. The Mobile Application Rating Scale (MARS) questionnaire was used to assess the smart phone app.

Results: The overall MARS score for the hand therapy app was 3.5 out of 5. The MARS also gathered information on the app's engagement, functionality, aesthetics, and subjective quality of the app with mean scores of 3.6, 3.8, and 3.7, respectively. Data was also collected on the app's description accuracy, goals, quality and quantity of information, visual information, credibility, and evidence base.

Discussion: Participants receiving skilled hand therapy gave an overall rating of *The Hand Therapy Application* as above average for providing information about the participants condition and for HEP instruction.

Conclusion: The findings of this study suggests that *The Hand Therapy Application* should be a consideration as a HEP tool in clinical practice.

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Introduction

Hand therapy rehabilitation literature has found that adherence to treatment has an impact on the overall efficacy of interventions and outcomes.¹⁻³ Evidence has also suggested that adherence to a home exercise program (HEP) in particular is the most important predictor of adherence.⁴ In addition to this, studies have established that a HEP itself is an effective treatment for individuals with both traumatic and chronic conditions impacting the hand

and upper extremity.⁵⁻⁸ Despite these findings, there are studies that report that 50-65% of patients are not adhering to their prescribed upper extremity HEPs.⁹⁻¹¹ Therefore, hand therapists are tasked with providing HEPs to those they treat in their practice in a manner that is appealing and best promotes compliance.

Generally speaking, a HEP for an individual attending hand therapy tends to be multimodal so that information that is taught in the clinic is carried over into the home environment. For example, exercises are often suggested that can be incorporated into daily routines and may require modification for protection of body structures or upholding of diagnosis precautions. However, ensuring carryover of an upper extremity HEP from the clinic to the home environment presents challenges and barriers.

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To optimize HEP adherence, hand therapists should understand barriers to HEP follow through and methods to maximize engagement in the suggested programs. A qualitative study¹² identified several obstacles to HEP adherence which include the complexity of the HEP, the number of exercises, the amount of time between follow up, the breakdown between supervised session and follow up, lack of motivation, and illness. Similarly, understanding an individual's learning style and reading ability plays a fundamental role in the success of the HEP process. The American Medical Association and the National Institutes of Health advocate that patient education material be no greater than a sixth-grade readability level.^{13,14} A validated tool used to understand learning styles for students, the VARK (Visual, Aural, Read/write, Kinesthetic) model¹⁵ can be a helpful approach when understanding our patients' learning style. Hart and Law¹⁶ integrated this method for patients with thumb carpometacarpal osteoarthritis and propose that incorporating VARK tools is a creative way to address a variety of learning styles for HEP instruction and may improve adherence and independent practice.

Historically, HEPs have been issued in a paper handout; however, technological advancements allow providers and patients to engage in patient education in more creative ways including self-made or web-based videos, and a variety of smart phone applications.¹⁷ The purpose of this study was to determine if people receiving hand therapy for an orthopedic injury distal to the shoulder find a hand therapy app useful in providing information about their condition and teaching home exercises through video demonstration.

Methods

Research Design

This study utilized a cross sectional cohort design that employed survey techniques to gather information on the patients' perspectives about the *Hand Therapy Application*. The application was developed by Hayley Fay an occupational therapist that received funding from the Chelsea and Westminster Hospital Foundation Trust. The application is free for download on smart devices. It allows a hand therapist to prescribe an individualized HEP. The user is then able to watch the videos of the exercises and set reminders to complete the exercises. Human subject approval for this study, was obtained by the university Institutional Review Board.

Participants

A convenience sample of individuals attending hand therapy at one outpatient orthopedic hand therapy clinic from May 2019 to January 2020 were invited to participate in this study. If the patient agreed to participate in the study a consent form was signed, and the app was downloaded on their phone. Inclusion criteria required that the patient be at least 18 years of age, able to understand English, and possess of a smart phone or tablet. Exclusion criteria included if the patient had a cognitive impairment that inhibited their ability to follow instructions or a visual impairment that would preclude their ability to view the screen on their device.

Instrument

The Mobile Application Rating Scale (MARS) was used to capture the application's engagement, functionality, aesthetics, and quality of information presented.¹⁸ The questionnaire also asks the respondent questions about the application's subjective quality. The items are scored using a Likert scale with answers corre-

Table 1
Demographics

Age range	Number of participants	%
18-35	9	22
35-55	19	46
55-75	10	24
75+	3	8
	41	100

sponding to each individual question. The MARS has been found to have excellent internal consistency ($\alpha = .90$) and good test-retest reliability and is suggested to be a simple tool for assessing the quality of mobile health apps.¹⁸

Data collection

Participants who met inclusion criteria were invited to participate in the study by their treating occupational therapist/certified hand therapist. Participants who agreed to take part in the study were assisted with downloading the smartphone app. The instructions were reviewed, and the appropriate exercise routine as recommended by the treating therapist was reviewed with the patient. The patient attended regular therapy sessions per usual as indicated and received other supplemental patient education materials such as pictorial sheets. After one week of using the app, each participant was asked to complete the MARS. A paper format of the survey was completed and assistance for completion was given as needed.

Data Analysis

This study was descriptive, and the data analyses were conducted using Microsoft Excel. After the data was checked for errors, results were analyzed using descriptive statistics. The mean and standard deviation for the MARS questions and frequency distributions were gathered.

Results

A total of 41 patients agreed to participation in the study and completed the questionnaire. Age was the only demographic included as other information was not relevant to this study. The mean age in the study was 49 years old. Ages ranged from 19 to 81. See [Table 1](#) for age data. The questionnaire scoring is based on a 5 point Likert scale which 1 indicates a variation of inadequate and 5 denotes a variation of excellent.

The MARS gathered information on the app's engagement, functionality, aesthetics, and subjective quality. Related to participant perception of engagement, the overall mean score was 3.6 with each question in this category having similarity in mean response (average of 3.5-3.8). Refer to [Table 2](#) for additional specifics on the engagement part of the MARS. The overall mean score in the functionality section of the MARS was 3.8 with most respondents selecting option 4 as their answer for each of the four questions under this section of the survey ([Table 3](#)). The mean score for the answer to each question in the aesthetics part of the MARS was 3.7 and therefore the overall mean score for the aesthetics category was 3.7. ([Table 4](#)) The MARS includes 5 questions in an information section that asks questions related to the app's description accuracy, goals, quality and quantity of information, visual information, credibility and evidence base. The overall mean score for this section was 3.5. ([Table 5](#)) The final section of the MARS relates to the subjective quality of the app. For this section of the MARS the mean score was 3.0. ([Table 6](#)) Overall, this is a MARS score of 3.5 for the Hand Therapy App from the participants in this study.

Table 2
Engagement

	Engagement					
	5	4	3	2	1	m
Entertainment: Is the app fun/entertaining to use?	4	24	11	2	0	3.7
Interest: Is the app interesting to use?	2	27	12	0	0	3.8
Customization: Does it provide/retain all necessary settings/preferences for app features?	5	21	13	2	0	3.7
Interactivity: Does it allow user input, provide feedback, contain prompts?	3	21	14	2	1	3.6
Target group: Is the app content (visual information, language, design) appropriate for your target audience?	4	26	17	4	0	3.5
Engagement mean score						3.6

Table 3
Functionality

	Functionality					
	5	4	3	2	1	m
Performance: How accurately/fast do the app features (functions) and components (buttons/menus) work?	9	20	12	2	0	3.9
Ease of use: How easy is it to learn how to use the app; how clear are the menu labels/icons and instructions?	5	26	8	2	0	3.8
Navigation: Is moving between screens logical/accurate/appropriate/ uninterrupted; are all necessary screen links present?	6	24	9	2	0	3.8
Gestural design: Are interactions (taps/swipes/pinches/scrolls) consistent and intuitive across all components/screens?	4	27	8	2	0	3.8
Functionality mean score						3.8

Table 4
Aesthetics

	Aesthetics					
	5	4	3	2	1	m
Layout: Is arrangement and size of buttons/icons/menus/content on the screen appropriate or zoomable if needed?	7	19	11	4	0	3.7
Layout: Is arrangement and size of buttons/icons/menus/content on the screen appropriate or zoomable if needed?	3	25	10	3	0	3.7
Visual appeal: How good does the app look?	3	23	13	2	0	3.7
Aesthetics mean score						3.7

Table 5
Information

	Information					
	5	4	3	2	1	m
Accuracy of app description (in app store: Does app contain what is described?)	5	19	14	3	0	3.6
Goals: Does app have specific, measurable and achievable goals (specified in app store description or within the app itself)?	4	20	12	5	0	3.6
Quality of information: Is app content correct, well written, and relevant to the goal/topic of the app?	4	19	15	3	0	3.6
Quantity of information: Is the extent coverage within the scope of the app; and comprehensive but concise?	5	17	16	3	0	3.6
Visual information: Is visual explanation of concepts – through charts/graphs/images/videos, etc. – clear, logical, correct?	1	23	12	5	0	3.5
Credibility: Does the app come from a legitimate source (specified in app store description or within the app itself)?	5	19	14	3	0	3.6
Evidence base: Has the app been trialed/tested; must be verified by evidence (in published scientific literature)?	1	17	20	3	0	3.4
Information Mean Score						3.5

Table 6
App subjective quality

	Subjective quality					
	5 Definitely	4	3 Maybe	2	1 Not at all	m
Would you recommend this app to people who might benefit from it?	1	10	17	13	0	3
How many times do you think you would use this app in the next 12 months if it was relevant to you?	5 >50	4 10-50	3 3-10	2 1-2	1 None	3.2
Would you pay for this app?	5 Yes		3 Maybe		1 No	2.9
What is your overall star rating of the app?	5 One of the best apps	4 Above Average	3 Average	2 Below Average	1 One of the worst apps	2.8
Subjective Quality Mean Score	0	7	18	16	0	3.0

Principal findings

The purpose of this study was to determine if people receiving hand therapy find a hand therapy app useful in providing information about their condition and for teaching home exercises through video demonstration.

Comparison to Other Research

The use and availability of mobile apps in the healthcare arena has become more mainstream in clinical practice.¹⁹ In 2020, a randomized controlled trial²⁰ was published that compared outcomes for individuals who had bone or soft tissue injuries to the digit, hand, and wrist when receiving a HEP via an interactive tablet app versus a paper copy of the same exercises. Individuals in the experimental group were found to have quicker return to work, fewer sessions of skilled rehabilitation, fewer plastic surgery consultations, and better short term recovery of pinch strength and function.²⁰ Another randomized trial published in 2019,²¹ used the above mentioned interactive tablet app versus a paper HEP in individuals status post a carpal tunnel release and found that the individuals in the group using the app had statistically significant more improvement in function according to the Disability of the Arm, Shoulder and Hand questionnaire at a four week follow up. Different from our current study, the aforementioned clinical trials focused on interactive sensorimotor exercise routines (ie, sliding your finger along with a circle on the screen), while the Hand Therapy app uses more traditional exercises such as flexor digitorum superficialis gliding exercises. In our current study, 40/41 participants used their smartphone and the above noted studies used tablets.

A SR which examined the clinical efficacy of smartphone-assisted self-rehabilitation in patients with frozen shoulder found no difference between the smartphone application group and the traditional HEP group regarding pain and ROM.²² The smartphone group had high patient rated satisfaction with the Technology Acceptance Model-2 and Usefulness, Satisfaction, and Ease of Use scores.²² Similarly, the current study found the mean score to be above average for the subsets of engagement, functionality, aesthetics, and information. A cross sectional study of hand therapy clients²³ found that 69% of participants preferred a video HEP format instead of a paper handout. The participants in the above study suggested that the video preference was due to increased understanding and confidence in correct performance of exercises using the video format.²³ A randomized controlled trial found improved adherence to a web-based home exercise program when compared to a traditional HEP for people with musculoskeletal disorders.²⁴ Additionally, a case study of a 54 year old woman who had an open reduction and internal fixation following a distal radius fracture with a complicating diagnosis of complex regional pain syndrome was discharged from skilled therapy with 1/10 pain and reported finding the use of hand therapy applications in her HEP as useful to her recovery.²⁵

3.2. Clinical Implications

The inclusion of smartphone technology in the rehabilitation process can enhance education and engagement by providing a variety of options for learning modules with targeted education and treatment. The use of digital technology is a simple, effective, and interactive way to provide education and treatment. The advanced technology allows for a visually appealing experience and may improve patient participation. Given the current climate of decreased insurance reimbursement, limited allowed visits, and high co-pays, the use of smartphone technology is an effective tool to ensure

that patients have a valuable option outside the clinical setting. This study indicates that the *Hand Therapy app* is a tool that patients find useful in the inclusion of their HEP.

Future Research

Future research is needed to establish a more targeted approach to the rehabilitation of conditions related to the hand and upper extremity. Likewise, research is needed to gain greater insight as to patient preference when it comes to smartphone applications as well as expanding the evidence on the clinical effectiveness on patient outcome. Future research is needed for the development of quality apps which are diagnosis specific as well as research evaluating the content of apps currently available

Limitations

Several participants identified survey length as an issue which may have impacted their responses. Data was collected at one clinic only and the sample size was small. Not all individuals attending therapy had a smartphone and others had a limited data plan so opted not to download the app and therefore did not participate in the study.

Conclusion

The *Hand Therapy app* was perceived overall as above average as a component of a HEP for individuals attending outpatient orthopedic skilled therapy for an upper extremity injury distal to the shoulder. Given the importance of adherence to HEPs in the hand therapy environment, therapists in this setting may consider inclusion of this app in their clinical practice.

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- # 1. The study design is
 - a. RCTs
 - b. qualitative
 - c. cross-sectional cohort
 - d. case series
- # 2. The authors were interested in finding out if a hand therapy app would
 - a. facilitate implementation of HEPs
 - b. be cost effective
 - c. be accepted by practicing CHTs
 - d. be approved by the HTCC
- # 3. The app was assessed by means of
 - a. a survey of Apple engineers
 - b. therapist interviews
 - c. patient interviews
 - d. a questionnaire

- # 4. The MARS score was
 - a. not determined
 - b. 5.0 out of 10
 - c. 3.5 out of 5.0
 - d. 4.5 out of 5.0
- # 5. The authors concluded that such an app should be developed and made available as soon as possible
 - a. true
 - b. false

When submitting to the HTCC for re-certification, please batch your JHT RFC certificates in groups of 3 or more to get full credit.