Development and validation of a mobile-centered digital health readiness: health literacy and equity scale (mDiHERS)

Hana Kim, Jisan Lee, Jae Hee Cheon, Nagyeom Yoon, Rebecca Schnall, Seong-Joon Koh

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Table of Contents

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Abstract

Background: There has been a rapid expansion of digital healthcare services, making the need for measuring and improving digital health readiness a priority. In response, our study team developed the Mobile-Centered Digital Health Readiness Scale: Health Literacy and Equity Scale (mDiHERS), to measure digital health readiness.

Objective: To develop and validate a scale that assesses digital health readiness, encompassing literacy and equity, and to ensure the effective use of mobile-centered digital health services.

Methods: This study was conducted from October 2021 to October 2022 to develop and validate the mDiHERS. Participants included patients with inflammatory bowel disease (IBD), a chronic condition requiring continuous management, and experts in medical and nursing informatics. The scale development involved a literature review, focus group interviews (FGIs), and content validity evaluations. A total of 440 IBD patients were recruited for the validation phase, with 403 completing the survey. The scale's validity and reliability were assessed through exploratory factor analysis and Cronbach's alpha. The scale was translated into English by translators and bilingual and native researchers, ensuring its applicability in diverse settings.

Results: The mDiHERS consists of 36 items across six domains, with a 5-point Likert scale for responses. The validation process confirmed the scale's construct validity, with four factors explaining 65.05% of the total variance. The scale's reliability was established with Cronbach's alpha values ranging from .84 to .91. The scale's development considered the technical proficiency necessary for engaging with health mobile applications and devices, reflecting the importance of subjective confidence and objective skills in digital health literacy.

Conclusions: The mDiHERS is a validated tool that quantifies patients' readiness and influencing factors to engage with digital health services. It also considers the users' characteristics, capabilities, and perceptions that influence these areas. It emphasizes the importance of considering cultural and educational backgrounds in digital health readiness and advocates for comprehensive support to enhance accessibility and equity. The mDiHERS is meaningful because it is essential to use and widely adopt health mobile applications and devices.

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Keywords: Digital health; health literacy; health equity; inflammatory bowel diseases; telemedicine; patient participation

Introduction

The healthcare system has witnessed a significant expansion in the digital healthcare service market in recent years. This burgeoning sector offers medical services through an array of wearable devices, and consumer anticipation for such innovations is rising [1]. The evolution of digital healthcare services is further propelled by patients who, as informed health consumers, are increasingly harnessing digital devices for health management [2]. Leveraging Information and Communication Technology (ICT), digital healthcare services transcend traditional boundaries, offering cost-effective medical solutions that are not solely reliant on medical personnel [3]. A notable advancement in this domain is remote health monitoring, which empowers patients to access healthcare services within the comfort of their homes, thereby fostering a sense of independence [3 4].

Increased utilization of digital health services has the potential to induce disparities in accessibility, proficiency, and the degree of health information and technology utilization among user groups, necessitating careful consideration of vulnerable populations. In response to these challenges, there is a growing emphasis on devising strategies to gauge the digital divide and implement system-wide solutions that champion digital inclusion, ensuring that marginalized groups are not left behind in the digital health landscape [5].

Yet, to support equitable provision of digital health services, prioritization should be given to measuring the digital divide rather than merely focusing on the means of delivery [6]. "Digital readiness" encompasses digital access, utilization, literacy, and the competency to engage with digital health services [7]. It emerges as a pertinent metric to assess disparities in digital health service utilization [7]. Motivated by this, the present study endeavors to construct and validate a scale measuring digital health readiness.

Inflammatory Bowel Disease (IBD), encompassing Crohn's disease and ulcerative colitis, is characterized by chronic digestive tract inflammation. This condition leads to a range of symptoms that significantly impact the quality of life [8]. The persistent symptoms and activity of IBD, even with the best medical or surgical interventions, highlight the critical need for ongoing surveillance and management [9]. Given the complex, chronic nature of IBD, which significantly impairs quality of life, there have been various efforts to leverage technologies to modify behaviors and assist in the self-management of patients with IBD [10 11]. As of 2023, while over 40 free English-language IBD mobile applications (apps) have been found to meet acceptable quality criteria, there is a crucial nee d for enhanced design features to improve user interest and engagement [12]. Recognizing the importance of continuous and personalized interventions, which focus on the immediate management of IBD symptoms [13], it becomes essential to evaluate patients' access to and understanding of

mobile technology about the available apps. The study, therefore, seeks to create an instrument for evaluating digital health preparedness, with an initial focus on individuals with IBD. This demographic is not only in dire need of digital health solutions but also exhibits a higher demand for such services. While first tested for specific conditions, the assessment tool is designed to be flexible and applicable across a spectrum of health scenarios [14]. Consequently, this instrument could be applied to a broad range of patient groups beyond IBD in subsequent studies, aiming to bridge the digital health divide.

Methods

Study design and population

This study was conducted from October 8, 2021, to October 7, 2022. IBD patients were recruited in STEP 2-1, 2-3, and 3-1. Recruitment was conducted in the outpatient clinic of the gastroenterology department at S University Hospital and S Hospital in Seoul and through IBD community in the social network service (e.g., KakaoTalk). The inclusion criteria were patients diagnosed with ulcerative colitis or Crohn's disease, adults over 18, and those who could use a smartphone. In STEP 2-1 and 2-3, respectively, six IBD patients were recruited [15] to conduct focus group interviews (FGI) to evaluate the qualitative appropriateness of the draft version of the scale. In STEP 3-1, the target sample size has been determined as 440, based on a calculation of ten times the number of items in the fourth draft version of the scale, while also accounting for an anticipated dropout rate of 10% [16].

In STEP 2-1 and 2-2, experts were recruited through snowball sampling to evaluate FGI and content validity. Six experts were recruited for STEP 2-1, including five nursing informatics experts and one medical informatics expert.

In STEP 2-2, eight experts were recruited, including four nursing informatics experts, one medical informatics expert, one educational expert, one gastroenterology physician, and one user experience (UX) designer.

Development of a digital health readiness scale

The primary objective of this study was to develop and validate a comprehensive scale for evaluating an individual's readiness to engage with digital health services. The instrument focuses on assessing digital health literacy and equity among users.

STEP 1. Literature review and derivation of an initial item pool

STEP 1-1: Literature review

A thorough review of existing literature about digital health readiness is undertaken. This included a review of scales and frameworks for digital health readiness, focusing on literacy and equity dimensions.

STEP 1-2: Derived initial items through review by a research team

To derive the item pool, sub-domains and specific items of scales and frameworks were identified. Preliminary items were critically evaluated, revised, and supplemented, leading to the formulation of the first draft of the assessment scale.

STEP 2. FGI and validity assessment

STEP 2-1: First round

FGI was conducted with IBD patients to assess the face validity of the initial scale items and to gather qualitative insights regarding their relevance. These interviews were conducted online and spanned approximately two hours. The methodology involved structured open-ended questions, probing for understanding and appropriateness of the scale items. The process continued until data saturation was reached, indicated by the absence of new emerging data [17]. The questions were "Do you comprehend the items presented in the scale?", "In cases of lack of understanding, could you specify which aspects are unclear?", "Do you find the items within the scale to be suitable and relevant?", "If you perceive any items as unsuitable, could you elaborate on the reasons?", "Are there any elements or items that you believe should be added to enhance the scale?", "Overall, what are your impressions or thoughts regarding the preliminary version of the scale?". In addition, FGI and content validity evaluation were conducted on six experts (five in nursing informatics and one in medical informatics). Based on the above results, the second draft version was completed.

Step 2-2: Second round

In this stage, eight experts conducted FGI and content validity evaluation on the draft derived from the previous stage. The eight experts comprised four in nursing informatics, one in medical informatics, a gastroenterology professor, an education doctorate, and a UX designer. Then, the third draft of the scale reflecting experts' opinions was derived.

Step 2-3: Third round

In steps 2-3, FGI and face validity evaluation were conducted for IBD patients using the draft scale derived in the previous step using the same method as step 2-1. The research team reviewed the revised scale reflecting patient opinions and completed the fourth draft.

Step 3. Validity and reliability assessment

Step 3-1. Administer scale to the participants

An online survey was administered to 440 IBD patients utilizing the second draft of the scale derived in the earlier stage.

Step 3-2. Construct validity

The construct validity was ascertained by examining the correlation between individual items and the overall scale score. A confirmatory factor analysis followed this.

Step 3-3. Reliability analysis

Cronbach's alpha value confirmed reliability, and if it was 0.75 or higher, it was evaluated as satisfactory, and if it was 0.6 or higher, it was evaluated as acceptable [16].

Step 4. Development of an English version of the scale

Step 4-1. Translation

Post reliability assessment, the final scale was concurrently developed in English and Korean to facilitate future translations. The Korean version was initially crafted, referenced by a translation into English adhering to the part of WHO translation guidelines [18].

Step 4-2. Experts review

Bilingual researchers specializing in medical informatics and nursing informatics reviewed the translated version of steps 4-1. Finally, a native English-speaking nursing informatics professor conducted a thorough review and revision, culminating in the finalized English scale version.

Statistical analysis

The scale development involved conducting a literature review, classifying the collected content, and deriving categories through analysis of the scale developed from the literature. The scale was evaluated for face validity targeting IBD patients, and its appropriateness was verified through expert

CVI evaluation. The final developed scale was conducted through a survey, and the survey results were analyzed using SPSS 21.0 as follows.

1 The demographic characteristics of the participants were analyzed by frequency, percentage, average, and standard deviation.
2 For the construct validity of the developed scale, item analysis was performed by calculating the correlation coefficient between individual items and the overall total score, and exploratory factor analysis was performed. Exploratory factor analysis was verified using principal component analysis and varimax rotation. Convergent validity was judged using the values derived through exploratory factor analysis, and the final questions were confirmed.
3 Cronbach's alpha confirmed the internal consistency of the developed scale.

Ethical consideration

This study was conducted after obtaining approval (H-2108-238-1251) from the Seoul National University Hospital Bioethics Review Committee before starting the study to ensure the ethical protection of the research participants. All study participants received an explanation of the study and completed written consent. All data collected during the study period were protected through appropriate safeguards. Additionally, compensation was provided to all participants.

Results

Development of a digital health readiness scale

The overall process of scale development and the results of each step are shown in Figure 1.

Step 1: Literature review and derivation of an initial item pool

STEP 1-1: Literature review

A thorough literature review was conducted to identify existing scales relevant to developing a digital health readiness evaluation scale for patients. The focus was primarily on mHealth literacy and digital health equity scales. Six scales and three frameworks on digital health readiness deemed suitable for the study were selected [20-28], and 97 items were confirmed from these scales and frameworks.

STEP 1-2: Review and classification of derived initial items by research team

The research team reviewed the 97 items derived from the above step and decided to classify the characteristics of users emphasized in the digital readiness-related frameworks into 7 items, classify them into one domain, and include them in the final scale.

Step 2. FGI and validity assessment

STEP 2-1: First round

Table 1 presents the results of face validity evaluation and FGI performed on six IBD patients. This process was instrumental in identifying items irrelevant to digital health readiness or requiring further clarification. The draft scale's content validity index (CVI) was rigorously assessed by six experts, with a threshold of 0.8 indicating high validity [29]. In addition, FGI was used to identify essential domains of digital health readiness not included in this scale and to evaluate whether the readability and language used were appropriate for the participants or data collectors [30]. As a result of the expert CVI evaluation, 20 out of 78 items were confirmed to be less than 0.8. These items were partially revised and supplemented based on expert opinions. Comments on modifying items identified through FGI included providing commonly used terms and examples to aid respondents' understanding. Moreover, duplicate items and items that did not fit the current medical environment were deleted. As a result, 14 of the existing 49 items were deleted, and 8 items (1 item on utility, 1 item on literacy, 2 items on equity, and 4 items on characteristics related to digital readiness) were added, completing the second draft with a total of 43 items. It was decided to classify 4 digital-related characteristics items added at the expert's suggestion and 1 item among the existing scale into the digital-related characteristics domain and include them into the final scale.

Table 1. Analysis of FGI and face validity for initial scale items.

No.	Item Description	Participant Feedback
2	You can use mobile devices to process administrative tasks and use electronic civil service services through public institution websites.	[Item relevance] Questioned the significance of differentiating equity based on the usage of electronic civil services.
12	You can contact health-related people and send files through SNS such as mobile KakaoTalk and Facebook.	[Item relevance] Noted that while proficient mobile users generally use apps effectively, there may be exceptions where skilled mobile users do not engage with

		social networking services.
18	Compare sources of health information and confirm whether the information is true.	[Item relevance] Raised doubts about the relevance of questions pertaining to the evaluation of comments or information sources.
34	For digital health equity, it is important for health care providers (doctors, nurses, etc.) to receive related education.	Emphasized the need for equal opportunities for those unable to use digital devices, but highlighted the challenge in assessing this through questionnaire items.
35	For digital health equity, it is important for medical consumers (patients) to receive related education.	
36	For digital health equity, it is important for those involved in medical service development (health app designers, mobile medical device developers) to receive related education.	
Overall Feedback	[Understanding of items] Participants found the terminology in the items complex and suggested modifications for easier comprehension by a broader audience. [Item relevance] Expressed uncertainty about the significance of some items in relation to digital literacy and equity.	

Step 2-2: Second round

In the expert CVI evaluation, 2 out of 78 items were confirmed to be less than 0.8 and were deleted. There were opinions that the items related to digital health equity in FGI were ambiguous, so some items were modified. Through this stage, the third draft with a total of 41 items was completed.

Step 2-3: Third round

Face validity and FGI were performed on six IBD patients. We collected opinions on the third draft derived from the previous stage and modified the scale by reflecting opinions on adding additional explanations to some terms and changing them with more accessible terms. Afterward, through review by the research team, one question inappropriate for measuring digital readiness was deleted. As a result, the fourth draft of 40 items was completed.

Step 3. Validity and reliability assessment

Step 3-1. Administer scale to the participants

The survey, designed to assess the validity and reliability of the developed scale, encompassed a total of 403 participants. The demographic breakdown revealed that 68.5% (n = 276) of the participants were under 40. Regarding gender distribution, 55.1% (n = 222) were male. Educational background indicated that a significant majority, 75.2% (n = 303), possessed at least a college degree. Detailed demographic characteristics are presented in Table 2.

Table 2. General characteristics (n=403).

Variables	Categories	n	%	M±SD
Age	≤20	131	32.5	
	21-39	145	36.0	
	40-49	69	17.1	36.24±11.75
	50-59	40	9.9	
	≥60	18	4.5	
Gender	Male	222	55.1	
	Female	181	44.9	
Residence area	Metropolitan area	329	81.6	
	The other	74	18.4	
Education	≤high school	100	24.8	
	College	254	63.0	
	≥Graduate school	49	12.2	
Disease excluding IBD	Digestive disease	266	66.0	
	Cardiovascular disease	15	3.7	
	Hypertension	16	4.0	
	Diabetes	10	2.5	
	Hyperlipidemia	16	4.0	
	Musculoskeletal disorders	12	3.0	
	Kidney disease	8	2.0	
	Respiratory diseases	14	3.5	
	Others	117	29.0	
The number of concurrent diseases excluding IBD	None	44	10.9	
	1	281	69.7	
	2	67	16.6	1.13±0.71
	3	6	1.5	
	≥4	5	1.2	
Digital readiness-related characteristics				9.98±2.74

Step 3-2. Constructive validity

Construct validity was verified with the fourth draft of 40 questions, and at this time, 12 questions regarding user characteristics and digital readiness-related characteristics that were decided to be included in the final questions were excluded from the analysis. Initially, the correlation coefficient between each item and the overall score was analyzed. Two items (F1, U1) with correlation coefficients below .3 were excluded [19]. The Kaiser-Meyer-Olkin (KMO) measure yielded a high value of .92, and Bartlett's test of sphericity was statistically significant ($\chi2$= 6940.63, p<.001), indicating suitability for factor analysis. All factor communalities were above .3. In the pattern matrix, items with factor loadings above .5 on two factors and those uniquely loaded on one factor were identified. Factor analysis was iteratively performed, removing one item at a time [20]. Ultimately, 24 items loaded on four factors. The KMO value for the final items was .91, and Bartlett's test of sphericity remained significant ($\chi2$= 6114.77, p<.001). The commonalities of the items were above .38, except for one item in factor 1. These four factors explained 65.05% of the total variance (Table 3). Despite low communality, one item from factor 1 was retained after consideration by the research team due to its relevance to the scale. The domain of the digital health readiness scale was named factor 1 as ‘Capability to use mobile services’, factor 2 as ‘mhealth literacy’, factor 3 as ‘Digital health equity’, and factor 4 as ‘Perception of the importance of mHealth apps and devices’ according to the content and characteristics of the loaded items.

Table 3. Exploratory factor analysis and reliability.

Items	Factor loading				Communality
	1	2	3	4	
F2	0.80				0.63
F3	0.84				0.74
F4	0.85				0.75
F6	0.78				0.66
U2	0.51				0.53
U3	0.61				0.64
U8	0.79				0.70
U11	0.52				0.29
E1	0.70				0.66

E2	0.76				0.67
U4		0.70			0.63
U5		0.83			0.74
U6		0.80			0.74
U9		0.67			0.63
U10		0.57			0.59
E5		0.62			0.46
E8			0.57		0.38
E10			0.74		0.65
E11			0.84		0.72
E12			0.80		0.69
E13			0.85		0.76
I1				0.81	0.76
I2				0.85	0.80
I3				0.83	0.79
Initial eigen value	9.19	3.09	1.91	1.42	
Cumulative variance (%)	38.27	51.15	59.12	65.05	
Cronbach alpha	.91	.86	.87	.84	

Step 3-3. Reliability

The internal consistency of the final scale was evaluated using Cronbach's alpha, as shown in Table 3. Cronbach’s alpha for each factor ranged from .84 to .91, indicating established reliability and acceptability of the newly developed scale [16].

This scale consists of 36 items, including 24 confirmed through reliability and validity verification, and 12 items (user characteristics, characteristics related to digital readiness) which were retained in the final scale during the scale development process (Textbox 1). Excluding the 12 items measuring user characteristics and characteristics related to digital readiness, the remaining 24 items were structured on a 5-point Likert scale. Responses range from 1 ('not at all') to 5 ('very much'). Five items dedicated to evaluating digital health readiness focus on aspects of digital health accessibility. Three items, presented as multiple-choice questions, inquire about health management, information acquisition methods, and familiarity with mobile devices used for digital health services. Two items probe the willingness to pay for mobile healthcare services or purchase a mobile healthcare device. Seven items gather data on user demographics, including age, gender, residence, occupation, education, subjective health status, and diagnosed diseases. The scale encompasses six domains. The total score is computed as the mean of the scores across four domains, excluding the user's characteristics and characteristics related to digital readiness. Scores range from 1 to 5, with higher scores indicating greater readiness for digital health utilization.

Textbox 1. Domains of digital health readiness: Digital health literacy and equity scale.

A. Mobile services capability (10 items)

This domain evaluates the respondent's knowledge and proficiency in mobile device use and the extent of their integration into daily life.

B. mhealth literacy understand and utilize mobile health apps and devices (6 items)

This section assesses the respondent's ability to comprehend and utilize information acquired through mobile health applications and devices.

C. Perception of the importance of mhealth apps and devices (3 items)

This domain gauges the respondent's perceived significance of mobile health applications and devices in healthcare management.

D. Digital health equity (5 items)

This domain focuses on the environmental and resource factors influencing digital health accessibility and competency. It evaluates the respondent's access to and capability with digital healthcare resources.

E. Characteristics related to digital readiness (5 items)

This domain identifies critical characteristics associated with the respondent's digital readiness. It includes methods of acquiring health information, familiarity with mobile devices for health information, experience in using digital healthcare services, and willingness to invest in and pay for digital health services. This domain assesses the respondent's accessibility to digital health resources.

F. User’s characteristics (7 items)

This section captures respondent's general demographic and socio-economic characteristics pertinent to digital health readiness. It covered age, gender, area of residence, occupation, education, subjective health status, and diagnosed diseases.

Step 4. Development of an English version of the scale

Step 4-1. Translation

The final scale completed in the previous step was translated into English by a qualified translator and researcher who majored in English and nursing. After being translated independently, any differences in translation were agreed upon through online communication.

Step 4-2. Experts review

Bilingual researchers in English and Korean reviewed the translation of steps 4-1. In the process, we ensured that the translation applied to English speakers and corrected any expressions or cultural differences that might convey a different meaning. The English version of the scale was finally completed after a thorough review and revision by a nursing informatics professor in the United States whose native language is English.

Discussion

Principal results

In the rapidly evolving field of digital healthcare, accessibility to digital health services is an essential determinant of health outcomes [21]. Consequently, the concept of digital inclusion, especially for vulnerable groups, is gaining prominence in the digital healthcare landscape, necessitating a thorough assessment and integration of these considerations into the design and delivery of digital health services [6]. The development of the Mobile-Centered Digital Health Readiness Scale (mDiHERS) for patients is a pioneering effort to quantify the readiness and capability of patients to engage with digital health services. This scale is particularly relevant given the chronic nature of IBD, which necessitates ongoing and continuous management and the potential for digital tools to enhance patient autonomy and care significantly. The mDiHERS addresses a critical gap in digital health literature by providing a validated tool that can assess patients' digital access, literacy, and equity, which are essential for the effective use of digital health services.

In mDiHERS, some items assess users' ability to navigate and interpret digital interfaces. This ability

is increasingly essential to affording opportunities to increase reach and engagement in the digital healthcare service [22]. Including items requiring users to interact with actual digital device screens —such as smartphones and wearable devices—addresses a vital component of digital health literacy: the technical proficiency necessary for engaging with health applications and platforms. This approach means that mDiHERS not only captures the subjective confidence of users in their digital capabilities but also provides an objective measure of their practical skills. In other words, the mDiHERS scale acknowledges this by ensuring its assessment criteria encompass users' perceived and actual abilities to manage their health digitally. This is particularly pertinent for patients who rely on digital health monitoring and management tools, as it empowers them to become active, informed participants in their healthcare journeys. By emphasizing both confidence and competence, the mDiHERS scale aligns with the goals of digital health initiatives, which aims to enhance patient autonomy and improve health outcomes through technology. This focus reflects the broader objectives within the digital health ecosystem, where patient empowerment and the democratization of health information are paramount.

The findings of this study underscore the importance of considering patient-specific factors when assessing digital readiness. The mDiHERS evaluates an individual's ability and familiarity with using digital health services and level of digital readiness, including the concept of equity, which has recently become necessary with the emergence of digital health services [7]. The tailored approach of the mDiHERS, focusing on IBD patients, allows for a nuanced understanding of the challenges and opportunities within this group. It is evident that while digital health services offer immense potential, their benefits are not uniformly accessible. The mDiHERS can thus serve as a diagnostic tool to identify areas where interventions are needed to improve digital health engagement and patient outcomes. If digital health services regularly monitor digital readiness, they can easily identify users who need additional support. Furthermore, it can also effectively evaluate interventions' effectiveness at all research stages. Therefore, the needs of digital health service users will be appropriately addressed.

Furthermore, assessing digital device usage skills should focus on more than just the technical aspects. As items in sections E and F of the mDiHERS exemplify, factors such as a patient's cultural and educational background can influence their ability to use digital devices, necessitating a comprehensive approach incorporating these variables. Educational support and interventions tailored to patients from cultural and educational environments with potentially lower digital device usage skills will significantly enhance digital health literacy, accessibility, and, ultimately, digital health equity [23]. The mDiHERS underscores the need for an assessment that evaluates technical

skills while also considering the patient's overall background and circumstances. This approach contributes to developing more inclusive and customized support strategies for effectively utilizing digital health services, ensuring all patients can benefit from advancements in digital healthcare.

The mDiHERS has the potential to be adapted for use in other patient populations and health conditions. Its application could lead to more personalized healthcare, where digital tools are used to their full potential to support health consumer’s care. However, the scale also highlights the need for healthcare systems to address the digital divide and ensure that all patients, particularly those with chronic conditions, have the necessary skills and resources to benefit from digital health innovations. The evolution of digital health services will likely present new challenges and opportunities, making the continuous refinement and application of tools like the mDiHERS essential for achieving equitable and effective healthcare delivery.

Limitations and recommendation

The generalizability of this study may be limited due to its reliance on a web-based survey. Future research should consider implementing paper-based surveys to include patients who may find web-based surveys challenging, further validating this tool. Further, generalizability may be limited since this study was limited to IBD patients. Furthermore, due to the resource constraints of our study, it was only feasible to adhere partially to the WHO translation guidelines for tools. However, we suggest that future translations of the tool into other languages should follow the WHO's translation guidelines for tools. Lastly, future studies are proposed to measure patient or health consumer digital readiness using the mDiHERS developed in this study to advance this research field. Subsequently, they should design and evaluate digital health services considering these results. This would facilitate the validation of the correlation between outcomes derived from the tool and the actual usage and effectiveness of digital health services.

Conclusions

The Mobile-Centered Digital Health Readiness Scale (mDiHERS) developed for this study marks a significant advancement in measuring patients' readiness to use digital health services, focusing on those with inflammatory bowel disease (IBD). This validated tool assesses digital access, literacy, and equity factors, which are crucial for effectively adopting digital health technologies. Development and validation of the mDiHERS highlight the importance of patients' confidence and competence in managing their health digitally.

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Conflicts of Interest

None declared

Data Availability

Data from this study are available upon reasonable request from the corresponding author.

Abbreviations

CVI: content validity index

FGI: focus group interview

IBD: inflammatory bowel disease

ICT: information and communication technology

mDiHERS: Mobile-centered Digital Health Readiness: Digital Health Literacy and Equity Scale

Multimedia Appendix 1. mDiHERS_English version.

Multimedia Appendix 2. mDiHERS_Korean version.

Multimedia Appendix 3. Consort-ehealth v1.6.

Multimedia Appendix 4. CHERRIES checklist for reporting results of internet e-surveys.

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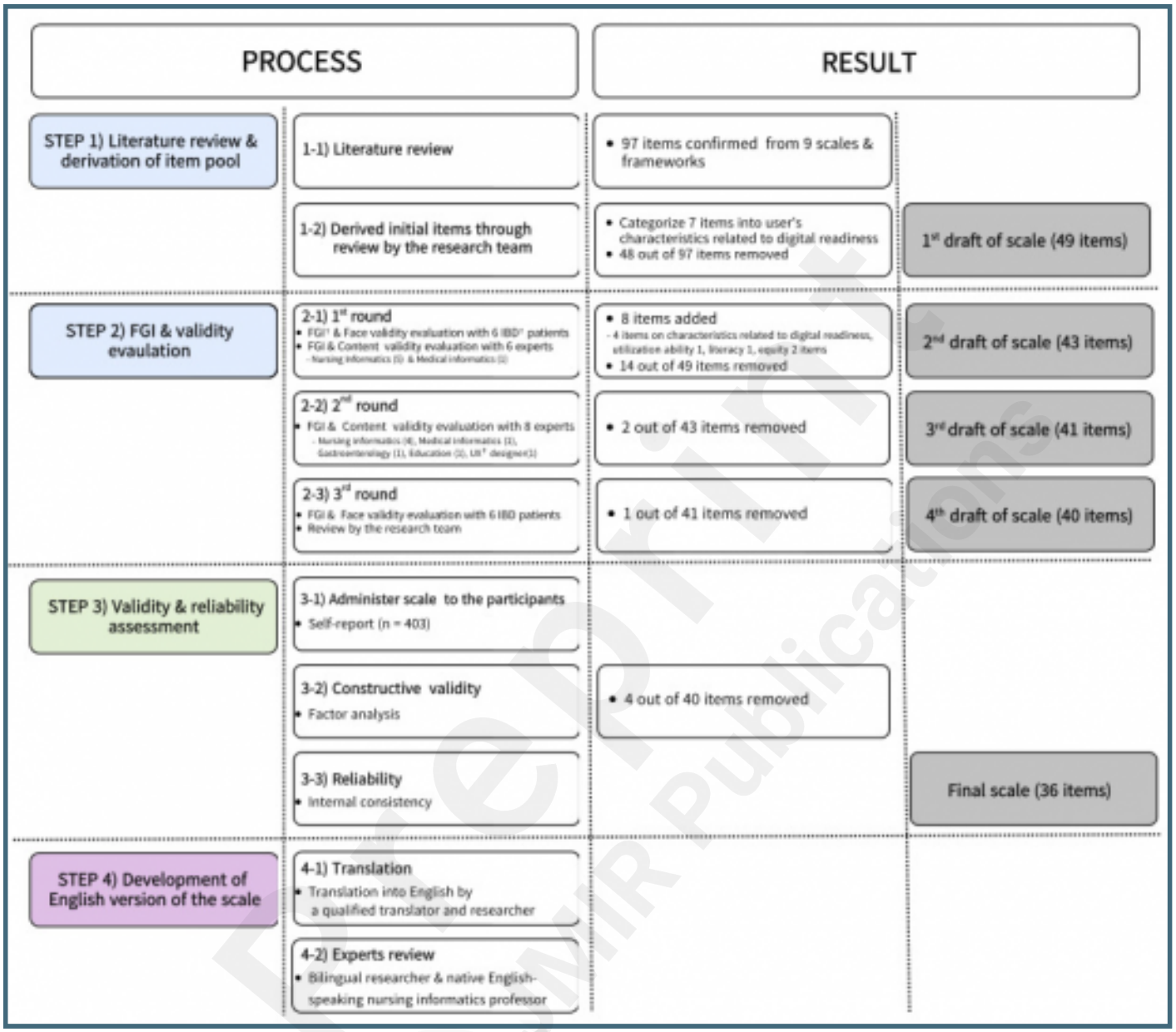
Figure 1. Study process and result of each step

[†]FGI: focus group interview; IBD: inflammatory bowel disease; UX: user experience

Supplementary Files

Figures

Study process and result of each step.



Multimedia Appendixes

mDiHERS_English version.
URL: http://asset.jmir.pub/assets/d0f0990e601a682a4da4425f402f0cff.pdf

mDiHERS_Korean version.
URL: http://asset.jmir.pub/assets/c162a079dff6648f895c817b454d09fb.pdf

Consort-ehealth v1.6.
URL: http://asset.jmir.pub/assets/8ae7dc54ccb1bc3cf3237fd19979f7c2.pdf

CHERRIES checklist for reporting results of internet e- surveys.
URL: http://asset.jmir.pub/assets/655d10b0f4ec43b9b6012c29f5ddf52f.pdf