Development and Validation of the Media Health Literacy Scale

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Abstract

Background: Advancements in information technology (IT) have transformed the way of accessing and conveying health-related information (HRI). While the technical advancement offers more options for people to choose their preferred information sources, injudicious dissemination of incorrect or unverified HRI by online media poses a threat to society. The concepts of media health literacy and e-health literacy have emerged for assessing one's ability to understand and use HRI from media sources. However, tools to evaluate the level of media health literacy comprehensively or following a solid validation process are scarce.

Objective: This study aimed to develop a validated tool to evaluate the level of media health literacy in adults.

Methods: A two-step tool development process, including item development and validation processes, was carried out. At first, tool development studies were identified by systematic review of the literature. Conceptual framework was established from the review by constructing an affinity diagram, and an item pool was generated. Face validation was conducted to assess whether the items measured media health literacy properly. Content validation was conducted to assess the overall relationship between domains by calculating the content validity index (CVI). Construct validation processes, including exploratory and confirmatory factor analyses, were completed with 1000 adults. Internal consistency of the Media Health Literacy Scale (MHLS) was assessed by Cronbach's alpha. Concurrent validation was conducted to validate the MHLS's performance by comparing it with a established tool—the Korean version of the eHealth Literacy scale (K-eHEALS).

Results: A total of 13 studies were identified and utilized to develop the conceptual framework. For the MHLS, an item pool of 65 items, including 3 domains (Access, Critical Evaluation, and Communication) and 9 subdomains, was created. Through face and content validation processes, the MHLS was refined to comprise 3 domains, 6 subdomains, and 29 items. Five subdomains were identified through exploratory factor analysis (EFA), and confirmatory factor analysis (CFA) demonstrated a good model fit. Following EFA and CFA, Cronbach's alpha scores of 0.915 and 0.927, respectively, were obtained, indicating that the tool had good reliability. Concurrent validity was also established; a positive correlation was found between the MHLS and K-eHEALS, indicating that the MHLS can assess the target concept similar to the K-eHEALS (Pearson correlation coefficient = 0.791, $p < 0.01$).

Conclusions: The MHLS was developed and validated in a step-by-step process to assess individuals' ability to access, critically evaluate, and communicate HRI through media platforms. This validated tool can serve in identifying deficiencies in specific MHLS areas and subsequently providing targeted education.

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Abstract

Background:

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The MHLS was developed and validated in a step-by-step process to assess individuals' ability to access, critically evaluate, and communicate HRI through media platforms. This validated tool can serve in identifying deficiencies in specific MHLS areas and subsequently providing targeted education.

Keywords: media; media health literacy; survey development; validation

Introduction

Advancements in information technology (IT) have significantly affected how people convey information through various types of media. One of the key changes transforming communication through media is characterized by a shift from one-way transmission to a multidirectional exchange of the information. This change in the modes of communication has resulted in a parallel increase in the volume of information, with the rate of production of new information through the Internet and social media accelerating in comparison to the past (1).

Changes in how information is conveyed profoundly affect the lives of people utilizing healthcare resources. Previously characterized by medical paternalism, healthcare professionals were the sole providers of health-related information (HRI). However, the multidirectional exchange of HRI has empowered patients with access to a plethora of healthcare services enabling them to choose services that align with their needs. Moreover, ease of access to HRI through various media platforms has brought positive effects to patient-centered care by providing the information that patients want immediately, expanding the perception of their illness, and fostering an environment in which patients make informed decisions (2). Although the ease of information delivery has had positive effects, incorrect or unverified information also started to circulate, leading to numerous cases of harm caused by unclear HRI (3).

To overcome these harms, the first step is to understand the phenomenon and identify the concepts. This led to the emergence of the concepts of media health literacy and e-health literacy, which assess people’s ability to understand HRI presented in the media. Media health literacy, which combines media literacy and health literacy, is the ability to identify health-related content across various types of media, recognize its influence on health behavior, critically analyze the content, and express an intention to respond through action (4). e-Health literacy, which is similar to media health literacy, is defined as the ability to seek, find, understand, and appraise health information from electronic sources and apply the knowledge gained to addressing or solving a health problem (5).

After conceptualization, several evaluation tools were developed and used to determine the level of the literacies for conducting any research (5-14). Although many tools evaluating related literacies have been developed to identify this ability, tools evaluating media health literacy comprehensively or following a solid validation process are lacking. Therefore, because the starting point of defining media health literacy involves combining media literacy and health literacy, our study investigated the domains of media and other related literacies to construct a conceptual framework aimed at

developing a corresponding media health literacy assessment tool, the Media Health Literacy Scale (MHLS).

Methods

The study process included the development and validation of a tool to evaluate the media health literacy of Korean adults. The concept of media health literacy was operationally defined as “one’s ability to access, critically evaluate and communicate health-related information by new-media.” This definition and the conceptual framework were based on studies related to media health literacy and e-health literacy (4, 15, 16). The tool development process involved the processes of item development and validation as follows.

Conceptual Framework and Item Generation

A systematic literature review was conducted to generate foundational data for the conceptual framework and item pool. Searches using the Medline, Embase, Cochrane library, KoreaMed, RISS, EBSCO, and Web of Science databases were conducted to find published studies on tools to evaluate *media literacy*. Additional searches were conducted to identify tools to evaluate *media health literacy* or *e-health literacy* using the same databases, except EBSCO and Web of Science. The keywords used for the literature searches are presented in Multimedia Appendix 1.

The tools identified from the systematic review were used to create an appropriate model consistent with the operational definition of media health literacy. An affinity diagram, usually used when there are various relevant concepts or issues that are complex to grasp (17), specified and categorized domains and subdomains within the model; the final conceptual model was constructed by organizing these domains and subdomains (17).

An item pool was created by collecting items identified from the systematic review by listing the tools and items from those tools. Each item was then assigned to the appropriate domain and subdomain within the final conceptual model, with similar items being merged and new items developed and added to the item pool. Items presented in English were translated to Korean by three internal researchers. The translated items were then modified by internal researchers and a Korean linguist who corrected grammatical errors and ensured cultural adaptation.

Face Validation

Using the initial draft of the survey, face validation was completed with the involvement of six internal researchers who have direct experience in interacting with or counseling patients about HRI. During this process, the appropriateness of each item assignment to a domain or subdomain was reviewed by the researchers based on the objectives of the MHLS. The descriptions of the items and

the subdomains were revised to enhance clarity, and redundant items were merged or rearranged to other subdomains after modification, if necessary.

Content Validation

Content validation was conducted to assess whether items were not only appropriately assigned to the domains and subdomains of the conceptual framework but also relevant to the overall theme of the MHLS, with scores graded by experts (18). A total of 15 experts (4 medical doctors, 5 nurses, and 6 pharmacists), who met the inclusion criteria of having direct experience in interacting or counseling patients in their practice settings, were recruited to conduct content validation.

The expert panel provided feedback on the tool in general, domains, subdomains, and items by ratings their level of agreement on a scale of 1 to 4, where 1 indicated that items were not related to domains and subdomains, 2 that they were slightly related, 3 that they were related, and 4 that they were highly related. The scoring was then converted, with scores of 1 and 2 coded as 0, implying disagreement, and scores of 3 and 4 coded as 1, implying agreement that items were allocated properly. The scores for each item were summed and divided by the number of participating experts (n = 15) to calculate the content validity index (CVI), based on which items with a CVI score of 0.8 or higher were retained; those with a score between 0.7 and 0.8 required further modification, enhancement, or deletion; and those with a score below 0.7 were removed from the item pool (18).

Item Analysis

Item analysis was conducted to evaluate the quality of each item. The mean, skewness, kurtoses of each item, and item-total correlation were calculated. Items with skewness and kurtoses values outside the range of ± 1 were excluded (19). Regarding item-total correlation, a correlation value less than 0.3 indicated that the corresponding item had low correlation and should be excluded (20).

Construct Validation

A survey was conducted for construct validation of the MHLS tool, including descriptive analysis, factor analysis, and reliability test. According to Comrey and Lee, a sample of 500 participants is considered a very good for factor analysis (21). A total of 1,000 participants aged 19 and above were recruited for each exploratory factor analysis and confirmatory factor analysis. The survey participants were eligible if they met the inclusion criteria of having searched for HRI on the Internet or media and having delivered HRI through media platforms. Healthcare professionals were excluded because of their better understanding of HRI. A stratified sampling scheme was used to reflect the sex and age corresponding to the population distribution in South Korea (22). The

participants were recruited through the Tillion Internet research panel managed by a survey company, Panel Marketing Interactive. They were informed of the purpose of the study and signed a consent form stating that their participation was voluntary. The survey was conducted between December 14 and November 22, 2021 (22). The study protocol was approved by the Institutional Review Board (IRB) of Seoul National University (IRB No. 2108/002-01). The study conformed to the principles embodied in the Declaration of Helsinki.

The Kaiser-Meyer-Olkin (KMO) measure and Barlett's sphericity test were used to assess the suitability of the respondent data for factor analysis (23, 24). Following the exploratory factor analysis (EFA) results, eigenvalues, variance percentages, and factor loadings of items were identified. Items with factor loadings below 0.40 were removed. All items were then reviewed to determine whether they were grouped with similar items in a factor and those that were considered to have different characteristics from other items in the factor were eliminated after discussion with the researchers (24).

The model provided by the EFA was validated through confirmatory factor analysis (CFA). Model fit was assessed based on chi-square tests, root mean square error of approximation (RMSEA), comparative fit index (CFI), and the standardized root mean residual (SRMR). The model was considered to have a good fit when each index satisfied the following scores: RMSEA under 0.5, CFI over 0.95, and SRMR under 0.08 (23). The reliability test was performed by calculating the Cronbach's alpha value. A Cronbach's alpha value of 0.7 or higher indicated acceptable internal consistency (25).

Concurrent Validation with the K-eHEALS

The MHLS tool was validated using the Korean version of the eHealth Literacy scale (K-eHEALS) to conduct concurrent validation, which aims to confirm the construct validity of the MHLS by comparing it with previously developed tools. This process involved examining the correlation between the K-eHEALS, which was a translated version of the eHealth Literacy scale (eHEALS) and had similar evaluation criteria, and the MHLS tool developed in this study, using Pearson correlation coefficients (26).

Results

Draft of the MHLS

A systematic review of related literacies identified 13 models (7-10, 12, 16, 27-32). Through the affinity diagram, domains of models were grouped with domains that present similar meanings. From the results of the affinity diagram, the European Association for Viewers Interests (EAVI) model, which included the domains of "*Use*," "*Critical Understanding*," and "*Communicative Abilities*," was selected as the main framework because of its comprehensive characteristics and similarity with operational definition. All domains from collected models were re-grouped under these three domains of the EAVI model (Multimedia Appendix 2). The conceptual framework to develop survey items was modified and constructed based on the result of affinity diagram, resulting in three domains ("*Access*," "*Critical Evaluation*," and "*Communication*") and nine subdomains (Table 1). The item pool was constructed using the collected questionnaires (65 items).

Face and content validation were conducted qualitatively. During face validation, the domains, subdomains, and all items in the conceptual framework were reviewed. As a result, the number of subdomains decreased from 9 to 6 and the number of items decreased from 65 to 33 (Table 1). Content validation resulted in a reduction of four items, considering the relationship between items and domains. One item with a CVI score higher than 0.8 was deleted because of duplication, and another with a CVI score between 0.8 and 0.7 was deleted because of a poor relationship with media health literacy. Six items with a CVI score under 0.7 should have been deleted, but two items each within the "Evaluation of quality on HRI" subdomain of the *Critical Evaluation* domain and the "Experience of communicating HRI" subdomain of the *Communication* domain were modified and retained because of their importance as judged by internal researchers. The S-CVI score/Ave was 0.83 and S-CVI/UA was 0.88.

Item analysis revealed a mean of 3.20 to 4.32. The skewness and kurtosis of whole items were in the range of ± 1 and the item-total correlation of whole items was higher than 0.3 (Multimedia Appendix 3).

Construct Validation of the MHLS

Following content validation of the MHLS draft, factor analysis was conducted to achieve construct validity. The 1000 participants were divided into two groups: 498 for EFA and 502 for CFA. The

characteristics of participants are summarized in Table 2. The KMO index was 0.938 and the *P*-value of Barlett's sphericity was under 0.001, with both indices indicating the factor analysis was appropriate.

The EFA identified five factors that explained 52.726% of cumulative variance. Direct Oblimin rotation was used and two items were deleted considering the factor loading on each factor. While one was excluded because the factor loading was under 0.4, the other one about experience with accessing HRI via media was excluded because the factor loading was over 0.4 with utilization of digital devices. Factors from EFA were named considering items that described each factor: "Digital device operational skills," "Experience and ability of accessing HRI," "Evaluation of quality of HRI," "Experience of communicating HRI," and "Responsible communication of HRI." The EFA identified 5 subdomains and 27 items (Table 3).

CFA was conducted with five factors model derived from the EFA. In total, 502 sex- and age-stratified samples from 1000 participants were included in the CFA. The CFA results are summarized in Table 4. All indicators represented good fit of the model. The structural equation model is presented in Figure 1.

Internal Consistency of the MHLS

Internal consistency was confirmed with Cronbach's alpha. The Cronbach's alpha score of the dataset used for EFA was 0.915, and the domain scores were as follows: "Digital device operational skills" = 0.888, "Experience and ability of accessing HRI" = 0.826, "Evaluation of quality on HRI" = 0.870, "Experience of communicating HRI" = 0.864, and "Responsible communication of HRI" = 0.748. The Cronbach's alpha score of dataset used for CFA was 0.927, and the domain scores were as follows: "Digital device operational skills" = 0.911, "Experience and ability of accessing HRI" = 0.824, "Evaluation of quality on HRI" = 0.888, "Experience of communicating HRI" = 0.849, and "Responsible communication of HRI" = 0.804. Scores indicated acceptable internal consistency.

Concurrent Validation of the MHLS

The correlation between the K-eHEALS and MHLS was positive, indicating that the MHLS can measure the target concept similar to the K-eHEALS. The Pearson correlation coefficient was 0.791, showing statistical significance ($P < 0.01$).

Discussion

People's increasing health concerns and interest in HRI (33) have resulted in a proliferation of HRI in the media, profoundly affecting public behavior (34, 35). Although various tools have been developed to evaluate how people interact with HRI in the media (5-14), no tool existed that comprehensively assessed the concepts following a rigorous validation process. The MHLS was developed to address this gap by offering quantitative scores measuring media health literacy across the domains of *Access*, *Critical Evaluation*, and *Communication*.

The development process was based on a framework that proposed these three abovementioned domains. The MHLS, structured by these domains, can measure the proficiency of individuals who interacted with HRI via media. In a recent study by Nazarnia et al. (14), the focus of the tool was on understanding HRI by suggesting the domains of *Goal Appraisal*, *Content Appraisal*, *Implicit Meaning Appraisal*, *Visual Comprehension*, and *Audience Appraisal Skill*. Levin-Zamir et al. (6) and Fleary et al. (13) also developed media health literacy measuring tools that included the domains of *Identification/Recognition*, *Influence/Critical Analysis*, and *Action/Reaction*. Additionally, eHEALS, which consists of six domains (traditional, health, information, scientific, media, and computer literacy) and has been utilized many studies to assess e-health literacy (36-38), offers four questions related to access and four questions related to utilization of HRI-related questions (5). The inclusion of the *Communication* domain, which elucidates how individuals interact with HRI, distinguishes itself with already developed tools and allows the MHLS to assess both the transmission of HRI and individuals' responsibility in HRI dissemination. Additionally, where harm by dissemination of misinformation is prominently evident (3, 39), the tool can grasp the characteristics of people who shared misinformation without realizing it and identifies weakness to improve for preventing the harm caused by misinformation.

The MHLS demonstrated structural strengths through well-executed development and validation processes. During the development stage, a systematic review of relevant literature was conducted to establish the conceptual framework and formulate items. Since there are various ways to develop items and a conceptual framework, (40, 41) appropriate methods were chosen based on the conditions of the research environment. The drafted items underwent a series of validation processes to ensure qualitative relationships with the items recommended in the literature (42). Construct validation, including factor analysis (both exploratory and confirmatory), and reliability and concurrent validity tests were conducted to quantitatively validate the tool (23, 25, 26). These

meticulous development and validation procedures guaranteed the validity of the MHLS (43).

To further confirm the validity of the MHLS, our study conducted concurrent validation with the K-eHEALS (26). The eHEALS was originally developed to assess e-health literacy among individuals using IT, while the K-eHEALS is the translated version specifically designed for Korean adults (5, 44). As e-health literacy shares several similarities with media health literacy, analyzing the correlation between the K-eHEALS and the MHLS can validate the effectiveness of the MHLS based on the correlation coefficient scores. The results indicated a positive correlation between the tools, suggesting that the MHLS effectively measures the level of media health literacy among survey participants.

Limitations

There are several limitations in our study. First, generalization of the MHLS can be challenging because the characteristics of participants did not represent those of the general public. The ratio of college graduates or those with higher educational qualifications in our study was 83.5 % in EFA and 83.9 % in CFA, which is significantly higher than the 34.6 % reported in a national study of Korea in 2022 (45). This may indicate that the survey participants cannot represent underserved populations. Moreover, because the panel used in the study recruited participants by e-mail or over the Internet, those who cannot use the Internet were not recruited. This resulted in only 10% of participants being aged 60 or over in this study, compared to approximately 15% in the Korean population (46). Moreover, the over-70 age group was entirely excluded. To ensure the validity of the MHLS in low literacy or older age groups, additional studies need to be conducted targeting those specific groups.

Second, the EFA results recommended that the model includes factors with eigenvalues greater than 1.0, but our model included a factor with an eigenvalue less than 1.0 because the model demonstrated a stronger relationship between items and factors based on factor loadings and item allocation (47). Subsequently, the CFA results indicated that the model had a good fit, surpassing the acceptable criteria. Structural equation modeling provided additional support for the model’s strong fit. The model effectively explained media health literacy, beginning with the construction of a framework and ensuring several types of validity.

Conclusions

The MHLS was developed and validated in a step-by-step process to assess individuals' ability to access, critically evaluate, and communicate HRI through media platforms. All these processes suggested that the MHLS performed as a well-developed and validated tool that can be applied to measure media health literacy, identifying skill gaps and assisting people who have difficulties in specific domains (48). This could prevent potential harm caused by misinformation related to health and promote public perception of HRI dissemination, eventually reducing healthcare costs (2).

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Conflicts of Interest

None declared.

Abbreviations

CFA: confirmatory factor analysis

CFI: comparative fit index

CVI: content validity index

EAVI: European Association for Viewers Interests

EFA: exploratory factor analysis

HRI: health-related information

IT: information technology

MHLS: Media Health Literacy Scale

RMSEA: root mean square error of approximation

SRMR: standardized root mean residual

Multimedia Appendix 1:

Search keyword.

Multimedia Appendix 2:

Affinity diagram.

Multimedia Appendix 3:

Item analysis results.

Multimedia Appendix 4:

Media Health Literacy Scale.

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Table

Table 1. The Change of domains, subdomains and number of items

	Draft of MHLS		After Face Validation		After Content Validation		After Construct Validation	
Domains	No. of Subdomains	No. of Items	No. of Subdomains	No. of Items	No. of Subdomains	No. of Items	No. of Subdomains	No. of Items
Access	3	17	3	12	3	11	2	10
Critical Evaluation	3	29	1	11	1	10	1	9
Communication	3	19	2	10	2	8	2	8
Total	9	65	6	33	6	29	5	27

Table 2. Characteristics of participants of construct validation

Characteristics	EFA (n=498) N (%)	CFA (n=502) N (%)
Age (years, Mean ± SD)	42.49 ± 12.37	42.58 ± 12.31
19 – 29	103 (20.7)	104 (20.7)
30 – 39	117 (23.5)	117 (23.3)
40 – 49	125 (25.1)	126 (25.1)
50 – 59	104 (20.9)	104 (20.7)
60 –	49 (9.8)	51 (10.2)
Sex		
Male	271 (54.4)	273 (54.4)
Female	227 (45.6)	229 (45.6)
Employment Status		
Yes	381 (76.5)	402 (80.1)
No	117 (23.5)	100 (19.9)
Education level		
Middle school graduate	1 (0.2)	1 (0.2)
High school graduate	81 (16.3)	80 (15.9)
College graduate or higher	416 (83.5)	421 (83.9)
Average monthly incomes		
5th quintile	53 (10.6)	45 (9.0)
4th quintile	75 (15.1)	77 (15.3)
3rd quintile	128 (25.7)	134 (26.7)
2nd quintile	141 (28.3)	144 (28.7)
1st quintile	101 (20.3)	102 (20.3)

Table 3. Exploratory factor analysis of MHLS

Subdomains	Item	Factors				
		1	2	3	4	5
Digital device operational skills	I can access the Internet via a digital device [a].			-.819		
	I can install programs or applications on digital devices [a].			-.732		
	I can operate a digital device [a] to navigate a search engine.			-.754		
	I can operate a digital device [a] to communicate or post information.			-.697		
Experience and ability of accessing HRI	When I come across HRI [b], I browse the Internet for additional related information.				.519	
	When I want to get HRI [b], I generally browse the websites of health-related public institutions or hospitals.				.498	
	I have experience finding desired HRI [b] on the Internet.				.446	
	I know where to search for HRI [b] on the Internet.				.627	
	I know which search terms to use to find HRI [b] on the Internet.				.592	
	I can choose the desired information from the abundant pool of HRI [b] available on the Internet.				.500	
Evaluation of quality on HRI	I consider whether the HRI [b] I come across on the Internet is accurate.	.454				
	I check whether the HRI [b] I come across on the Internet is up to date.	.586				
	I check the sources of the HRI [b] I come across on the Internet.	.683				
	I check whether the HRI [b] I come across on the Internet is provided by healthcare professionals [c].	.613				
	I check whether the HRI [b] I come across on the Internet is corroborated by scientific evidence [d].	.603				

	I check for intentions or purposes (e.g., political leaning or advertising) behind the HRI I come across on the Internet.	.561				
	I check whether the HRI [b] I come across on the Internet highlights only the positive effects or conceals the risks.	.606				
	I check the accuracy of the HRI [b] I come across on the Internet by cross-referencing multiple websites.	.520				
	I check the accuracy of the HRI [b] I come across on the Internet by consulting a healthcare professional [c].	.609				
Experience of communicating HRI	I press the *recommend*, *do not recommend*, *like*, or *dislike* buttons on HRI [b] posts I come across on the Internet to express my opinion [e].		.723			
	I write comments on HRI [b] posts I come across on the Internet to express my opinion [e].		.817			
	I forward HRI [b] posts I come across on the Internet to others via messaging apps.		.676			
	I post texts, images, or videos with HRI [b] on the Internet (e.g., blog, online forum, YouTube, social media).		.710			
Responsible communication of HRI	I check whether the HRI [b] on the internet is accurate when I post, forward, or express opinions [e] thorough the internet.					.585
	I believe that the HRI [b] that I post, forward, or comment on over the Internet (including likes, recommendations, comments) may affect the health or well-being of others or society.					.561
	I check whether the HRI [b] I post, forward, or comment on over the Internet (including likes, recommendations, comments) contains any material that violates the law.					.520
	I disclose the source of the online HRI [b] when I post or forward it.					.499
	Eigen value	8.76	4.26	1.47	1.20	0.86
	Proportion of variance: total 52.726%	30.47	14.38	3.67	2.73	1.48

[a] Digital device: smartphone, computer, tablet PCs
[b] HRI: news, advertisements, articles, blogs, content on YouTube and other social media)
[c] Healthcare professionals: physicians, doctors of Korean medicine, dentists, pharmacists, nurses, nursing assistants, etc
[d] Scientific evidence: evidence provided by healthcare professionals, professional organization, journal article, government documents, etc
[e] Opinions: likes, recommendations, comments

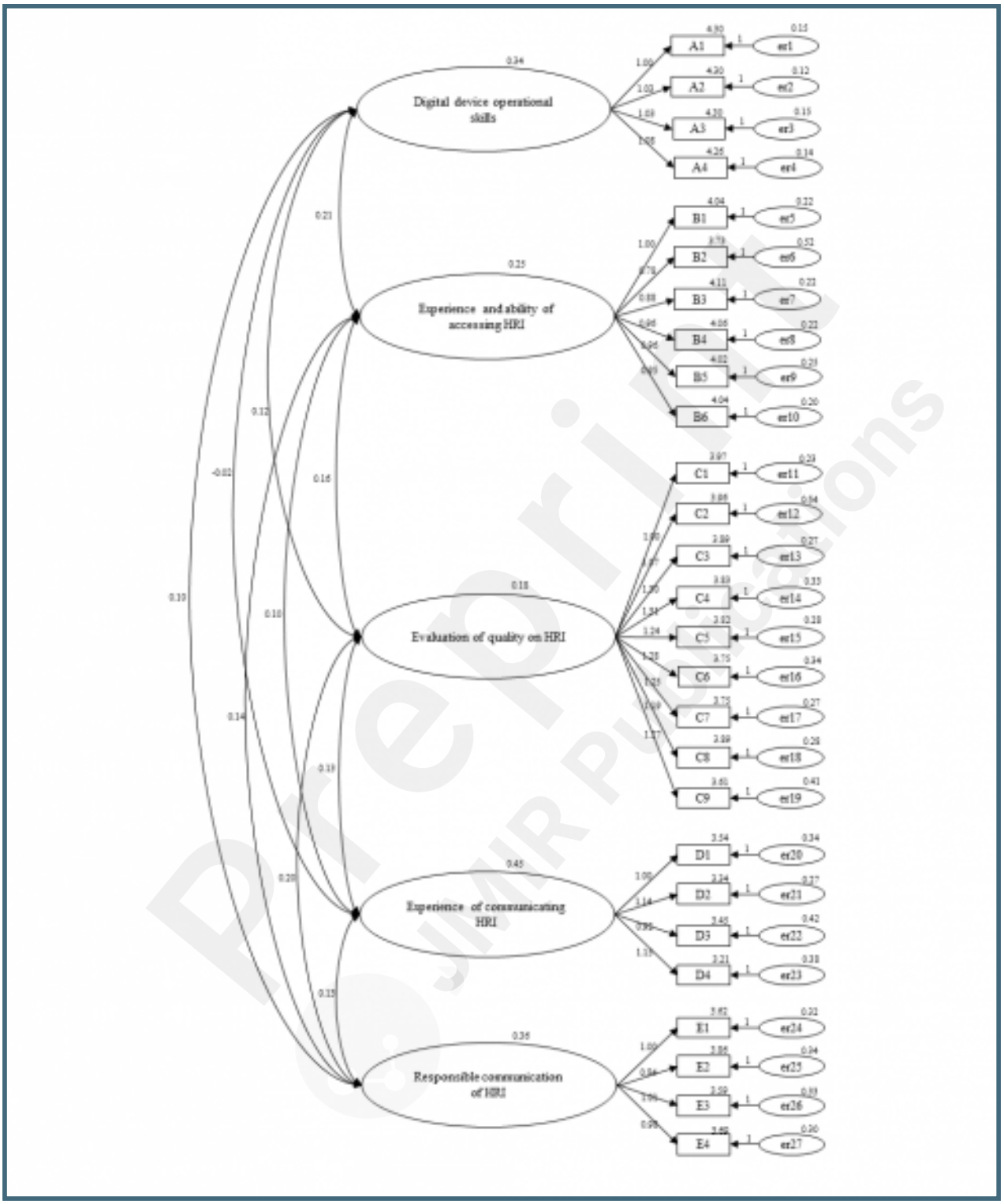
Table 4. The Scores of Confirmatory Factor Analysis

Index	Cmin X^2/df	Root Mean Square Error of Approximation (RMSEA)	Comparative Fit Index (CFI)	Standardized Root Mean Residual (SRMR)
Optimal model	< 3	< 0.10	> 0.90	< 0.08
MHLS model	2.659	0.058 (0.053-0.062)	0.927	0.0666

Supplementary Files

Figures

Structural equation model by CFA.



Multimedia Appendixes

Search keyword.
URL: http://asset.jmir.pub/assets/81aaa8e3d921910b4335da8ead01a535.docx

Affinity diagram.
URL: http://asset.jmir.pub/assets/f91c18946d7ce3eb8a89306628e15941.png

Item analysis results.
URL: http://asset.jmir.pub/assets/58b0d290ec2eab3a9eab6ef960d56e94.docx

Media Health Literacy Scale.
URL: http://asset.jmir.pub/assets/36fd417094a03f532edb02fe0d8cb1d7.docx