Taylor & Francis
Taylor & Francis Group

Informatics for Health and Social Care

ISSN: (Print) (Online) Journal homepage: www.tandfonline.com/journals/imif20

Validation of the eHealth literacy scales: comparison between the shorter and longer versions

Areti Efthymiou, Argyroula Kalaitzaki, Michael Rovithis & Gregor Petrič

To cite this article: Areti Efthymiou, Argyroula Kalaitzaki, Michael Rovithis & Gregor Petrič (17 Jan 2025): Validation of the eHealth literacy scales: comparison between the shorter and longer versions, Informatics for Health and Social Care, DOI: 10.1080/17538157.2025.2451427

To link to this article: https://doi.org/10.1080/17538157.2025.2451427

INFORMATICS FOR HEALTH AND SOCIAL CARE
https://doi.org/10.1080/17538157.2025.2451427

Taylor & Francis
Taylor & Francis Group

Validation of the eHealth literacy scales: comparison between the shorter and longer versions

Areti Efthymiou [a], Argyroula Kalaitzaki [a,b], Michael Rovithis [a,c], and Gregor Petrič [d]

[a]Quality of Life Lab, Social Work Department, Hellenic Mediterranean University, Heraklion, Crete, Greece; [b]Affiliated Researcher of the Research Centre 'Institute of Agri-Food and Life Sciences', Hellenic Mediterranean University, Heraklion, Crete, Greece; [c]Department of Business Administration and Tourism, Hellenic Mediterranean University, Heraklion, Crete, Greece; [d]Department of Social Informatics, Faculty of Social Sciences, University of Ljubljana, Ljubljana, Slovenia

ABSTRACT

Digital service provision became necessary during and after the COVID-19 pandemic highlighting the technological disparity experienced by healthcare professionals and healthcare users. eHealth Literacy skills are mostly measured with the use of the eHeals, but recently more instruments have been developed to meet this need. The aim of the study was to validate and compare the two scales in Greek: the eHeals and the revised eHeals-Extended. In total, 401 participants replied to the eHeals, the revised eHeals-Extended, and the HLS-EU-Q16. The eHeals scales provided good psychometric properties. The validation of the eHeals confirmed the two dimensions with high internal consistency (total score α = .91, eHeals1 α = .88, eHeals2 α = .78). The revised eHeals-Extended exploratory analysis extracted five factors with satisfactory internal consistency (Cronbach's α = .62–.89): awareness and quality of resources online, understanding online information, smart on the net, accessing and validating online information and perceived efficiency. The use of the revised eHeals-Extended and eHeals validated in Greek, could be valuable tools in clinical and research settings. The eHeals could be used as an additional tool when eHealth Literacy is not the core concept measured and the revised eHeals-Extended can be used when researchers wish to measure eHealth Literacy concept more thoroughly.

KEYWORDS

eHealth literacy; health literacy; health information; validation; psychometric properties

Introduction

eHealth literacy has recently received attention due to the health demands derived from the COVID-19 pandemic.[1] On the one hand, healthcare had to adapt and provide alternative forms of communication, such as remote healthcare and disease management, while on the other hand, healthcare users had to be trained on how to locate and access these services.[2] An updated LILY model for eHealth literacy was developed that included the crisis dimensions of the pandemic: quarantine, physical and social distancing, and isolation.[1]

Healthcare digital service provision was classified by the World Health Organization to services targeting healthcare users' needs, healthcare professionals' needs, health system managers' needs, and data services.[3] The aforementioned categorization included a variety of services such as healthcare professionals-healthcare user interaction, peer-to-peer communication, emergency management, self-monitoring, finding and accessing information and health data, management of financial transactions, transmission of lab results, human resource and supply management, data collection, and many more services.[3]

CONTACT Areti Efthymiou arefthymiou@yahoo.com Quality of Life Lab, Social Work Department, Hellenic Mediterranean University, Estavromenos, Heraklion, Crete 71410, Greece

eHealth literacy is not only a matter of the healthcare user but, as in the case of Health literacy, many community stakeholders are also involved.[4] Numerous healthcare professionals encounter obstacles when utilizing eHealth systems.[5] In a recent study, Greek nurses had difficulty accessing and finding online health information.[5] On the other hand, in a convenient sample of 1064 people living in Greece, the level of eHealth literacy was measured, with almost half of the sample ($n = 547$, 51%) reporting an adequate level of eHealth literacy.[6] The level of eHealth literacy was differentiated by age groups, with the older participants reporting lower level of eHealth literacy.[6]

The 8-item eHeals scale is typically the preferred instrument for measuring eHealth literacy.[7] The scale has been adapted in 18 languages and for carers.[8,9] The eHeals scale had been the focus of the eHealth literacy research for many years. Researchers investigated the dimensionality of the scale and provided one, two, or three factors.[9] A systematic review revealed that there are additional instruments to assess eHealth literacy[9]: eHeals-Extended (eHeals-E) version (21 items), e-Health Literacy Scale (19 items), Digital Health Literacy Instrument (DHLI) (21 items), eHealth Literacy Assessment (42 items), eHealth Literacy Questionnaire (eHLQ) (35 items), Transactional eHealth Literacy Instrument (TeHLI) (18 items). All eHealth literacy instruments had low relevance with the concept as indicated by the content validity. Only the eHeals-E scale had moderate relevance with the concept.[9]

The eHeals English version and adaptations had good psychometric properties.[9] However, one of the most significant flaws of the scale was the lack of a revised version to align with technological advances and the appearance of Web 2.0 services.[10] Web 2.0 surpassed traditional websites, evolving into web applications that can be easily installed on any device.[11] Web 2.0, known as "the social web," can be considered the "read and write" web.[12] Now we live in the era of Web 3.0, the "semantic web," an extension of Web 2.0 that focuses on more productive cooperation between people and computers. The core ideas of the Semantic Web involve assigning labels or keywords to things (e.g., objects, concepts, or data points) with machine-readable metadata, using specific terms and languages to explain the terms and their connections.[13] In healthcare, Web 3.0 provides more personalized healthcare information, allowing users to manage their own health data securely, access their records, and share them with healthcare providers as needed.[12]

Most instruments developed in response to the eHeals' flaws focusing on web 2.0.[14] The extended version by Petrič et al.[15] integrated these new concepts of Web 2.0, including 21 items across six dimensions: awareness of resources, quality, comprehension of information, skills, validating resources, and being smart of the Net.[15] The extended version followed the LILY model and included items related to eHealth literacy (access, understand, appraise, apply, health online information). Recently, a revised version of the eHeals-E scale was published that includes new and revised items that address the experiences with contemporary digital systems.[16] Efforts have also been made to integrate dimensions of Web 2.0 and 3.0 into the measurement of eHealth Literacy, as in the development and validation of the eHealth Literacy Scale – Web 3.0 among Chinese college students.[14]

The aim of this study is to validate in Greek and compare the eHeals scale and the revised version of eHeals-E. The two scales will be part of the Health Literacy Universal Precautions Toolkit which was adapted in Greek for healthcare professionals working with older adults[17]

Methods

Study design and participants

A cross-sectional online study with a convenient sample of people living in Greece was conducted from June to October 2022. Eligibility criteria included the participants living in Greece, speak Greek, and be over 18 years old. The link to the study was published in closed and open groups of social media (e.g., Facebook, LinkedIn). In total 401 participants, a convenient sample, replied to the online survey posts.

The questionnaires: eHeals, eHeals-e, and HLS-EU-Q16

The 8-item eHeals[18] is a short scale, with a total score ranging from 8 to 40. Higher scores report higher eHealth Literacy levels. The permission to be validated was granted by the authors in an earlier research stage as part of the adaptation in Greek of the eHeals-Carer.[19] The 8-item scale is a widely used instrument facing issues in relation to technological advances including questions of Web 2.0 and now Web 3.0.[10] The scale in English had high internal consistency (α=.88) but low test–retest reliability (ICC=.49). According to Norman, the questionnaire is unidimensional but there has been a great debate on its dimensionality over the last decade proposing two or three dimensions.[20]

The initial eHeals-Extended scale that was tested on users of online communities included 21 items across six dimensions: awareness of resources, quality, comprehension of information, skills, validating resources, and being smart on the Net.[15]

The permission to validate the revised eHeals-Extended scale was granted by the developer, Petrič, to the principal investigator and a short teleconference was organized with him to discuss the process and clarify questions. This scale was recently expanded and revised to better suit the general population and to address the contemporary landscape of digital systems for health-related information seeking. The updated 32-item pool, initially developed in Slovene, was further refined based on its psychometric properties and measurement equivalence across sociodemographic groups.[16] This 32-item pool was also used in the present study. Using the English version of the scale, which was originally created in Slovene, a Greek version of the scale was subsequently developed. A forward and backward translation was conducted by two researchers fluent in English and Greek.

The Health Literacy Survey-EU-Questionnaire 16 (HLS-EU-Q16) was included to examine the convergent/divergent validity. The scale was originally developed as part of the HLS-EU study[21] and it was validated in Greek as part of the research for carers.[22] The original scale was based on a framework of 12 factors. It has 16 items and its total score range from 0 to 16. In the Greek version, five factors have been revealed: Health promotion, media Health Literacy, compliance with doctor's instruction, healthcare and access, and health-related decision-making with moderate internal consistency.

Data analysis

The analysis was conducted with SPSS version 29.0 and R version 4.2.2. The eHeals and revised eHeals-E scales were backward and forward translated. The content validity was assessed by a team of seven experts by calculating the following three indices: item-CVI, Scale-CVI/Average, and Scale-CVI /UA. Scores over .80 indicate high content validity.[23] Item-CVI calculates the number of experts who agreed on the relevance of each item to the research concept, divided by the total number of experts. Scale-CVI/Average is the average score of all item-CVIs. The Scale-CVI/UA is calculated by summarizing the number of items that all experts agreed on as relevant, divided by the total number of scale items, e.g., if two experts agreed on two of the three items, then the scale-CVI/UA = 2/3.[23]

The ceiling and floor effects of the questionnaire were assessed based on the criterion of 15% of responses of the highest or lowest point.[24] Exploratory and confirmatory factor analyses were employed. In time of developing the tool, the process of validation of the Slovene revised version of eHeals-E was not concluded yet. Consequently, we proceeded first with exploratory factor analysis. Confirmatory factor analysis was conducted for the eHeals scale as a Greek-adapted version for carers providing two factors (5-item awareness and 3-item evaluation of sources). The modification indices were calculated to improve the model fit of the two-factor model since RMSEA and $\chi 2/df$ did not comply with the acceptable cutoffs.[25]

Cronbach's α, mean item-total correlation, mean inter-item correlation, and corrected item-total correlation were used to compare the two scales. The mean item-total correlation is the mean of the correlations of the items with the total score. Item-total correlations below .30 mean that the item does not measure the same construct as the other items.[26] The mean inter-item correlation calculates the mean correlation of the items with all the other items of the scales. Scores ranging between .15 and .50 mean that

the items are measuring different aspects of the same construct.[27] The internal consistency of the tool (Cronbach's alpha) was calculated for all the factors extracted. Correlations were used to calculate convergent and divergent validity of eHeals and eHeals-E with HLS-EU-Q16.

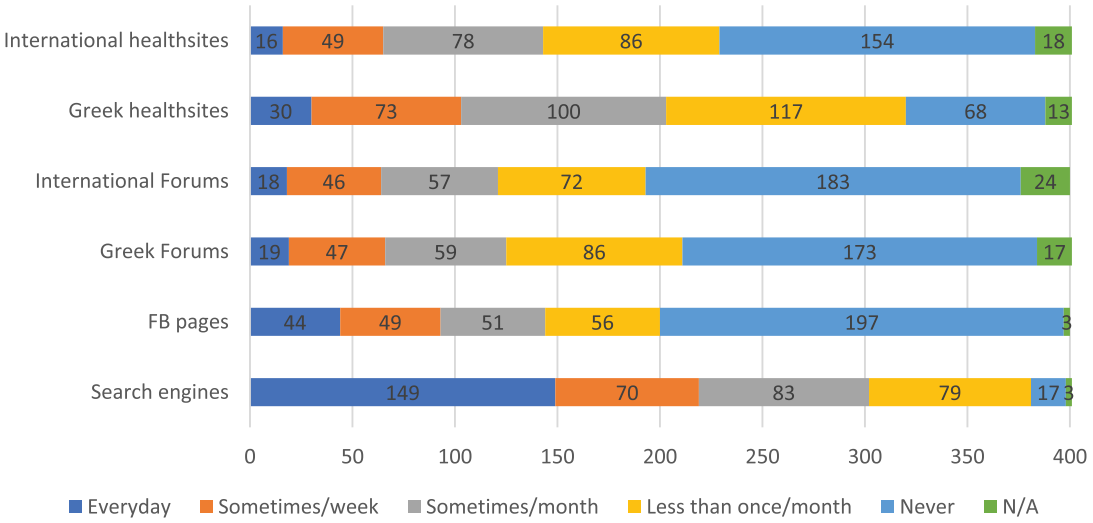
Ethics

This study was part of the development of a Health Literacy Toolkit for healthcare professionals working with older adults and permission was granted by the ethical committee of the Hellenic Mediterranean University (63/ΕΜΠ 95). Participants had to agree and consent to their participation in the study. The study was anonymous, and participants received detailed information on the purpose of the study. Researchers' telephone numbers and e-mails were provided in case any participant would need to withdraw their data. The data have been downloaded and kept in a password-protected file. Questionnaire links have been erased.

Results

Most of the participants were women ($n = 316$, 79%), living in Attica ($n = 148$, 44.8%) and Crete ($n = 74$, 22%), the mean age was 31 years (sd = 13.48, age range 18 to 72), and they had attained a tertiary degree ($n = 227$, 56.8%). Approximately half of the sample were students ($n = 173$, 43%), one in four ($n = 83$, 20%) worked in the public sector and another 20% ($n = 81$) in the private sector. One in four were healthcare professionals. Most of the participants reported that they had good or very good health, without any chronic health issues, and good or very good quality of life (Table 1).

In the previous 12 months, the participants searched for health-related information primarily via search engines and Greek health sites and rarely via social media, forums, and international websites (Graph 1). The HLS-EU-Q16 mean total score was 13.81 (SD = 2.99), the eHeals-GR-8 items mean total score was 25.97 (SD = 5.73). The eHeals-E-GR according to the authors do not provide a total score.



Graph 1. Use of Internet.

Content validity and distribution of the items

The eHeals-GR and the eHeals-E-GR scales provided high item CVIs ranging from .86 to 1.00 as well as high S-CVI/Ave scores (eHeals-GR=.99 and eHeals-E-GR=.97) in both cases. The S-CVI/UA was also satisfactory (eHeals-GR = .86, eHeals-E-GR= .81).

Table 1. Sociodemographic characteristics of the sample.

Variable	N (%)
Gender	
Female	316(79%)
Male	82 (20.5)
Other	2 (.5%)
Age (M/SD/age range)	31.13 (13.48/18–72)
Education	
Lower secondary	5 (1%)
Upper secondary	73 (18.3%)
After secondary	81 (20.3%)
Tertiary (incl. postgraduate edu)	227 (56.8)
Doctoral and postdoctoral edu	14 (3.5%)
Occupation	
Public servant	83 (20.8%)
Private employee	84 (21%)
Free lancer	33 (8.3%)
Agriculture	1 (0.3%)
Housekeeping	6 (1.5%)
Student	173 (43.3%)
Pensioner	5 (1.3%)
Unemployed	15 (3.8%)
Healthcare Professionals	
Yes	86 (21.6%)
No	313 (78.4%)
Family Status	
Married/Cohabitate	132 (33%)
Single	253 (63.2%)
Divorced	13 (3.3%)
Widowed	2 (0.5%)
Health Status	
Very bad	1 (.3%)
bad	1 (.3%)
Neither bad or good	47 (11.8%)
good	216 (54%)
Very good	135 (43.8%)
QoL	
bad	5 (1.3%)
Neither bad or good	80 (20%)
good	229 (57%)
Very good	86 (21.5%)
Health Issue	
Yes	80 (20%)
No	308 (77%)
N/A	12 (3%)

Experts agreed on 7 out of 8 items for the eHeals-GR, (except item 4) and on 26 items of 32 for the eHeals-E-GR (see Table 2). Five experts reported the need to edit items 1, 3, 4, 5, 6, 14, and 17. Experts also reported that item 15 had a similar meaning to that of items 19 and 20. One expert reported that items 25 and 26 had the same meaning. The validation team thoroughly reviewed all comments and the feedback by the experts was integrated into the scale. Greek translations are available in Tables 3 and 4.

The means of the eHeals-E-GR and the eHeals-GR were close to the median and standard deviations were lower than half of the mean in all items. Half of the items (16/32) of the eHeals-E-GR were moderately left (negatively) skewed and in the majority, kurtosis was close to zero and only in a few items platykurtic. Ceiling effects were detected for two items (Item 21 and 27). The majority of the eHeals items were skewed and mesokurtic (6/8). Descriptive statistics of the eHeals-E-GR are presented in Table 2.

Table 2. E-heals-E descriptive statistics.

Items	English version	Greek version	Mean (SD)	Median	Skewness	Kurtosis	Cronbach if Item deleted	Corrected Item- Total Correlation	Factor loadings
EhealE1	**Awareness resources and recognizing quality**								
30	I can identify useful tips for addressing my health issues from information online.	Μπορώ να εντοπίσω χρήσιμες συμβουλές για να αντιμετωπίσω τα θέματα υγείας μου σε πληροφορίες στο διαδίκτυο	**3.25 (1.18)**	**3**	**−.629**	**−.005**	**.869**	**.70**	**.786**
25	I have no difficulties understanding the substance of the information online.	Δε δυσκολεύομαι να κατανοήσω την ουσία των πληροφοριών στο διαδίκτυο	**3.27 (1.25)**	**3**	**−.646**	**−.043**	**.867**	**.72**	**.758**
32	I know where to find useful sources of information on health online.	Γνωρίζω που να βρω χρήσιμες πηγές πληροφοριών για την υγεία στο διαδίκτυο	**3.18 (1.24)**	**3**	**−.598**	**−.097**	**.866**	**.73**	**.776**
26	I have sufficient knowledge to assess the quality of online sources.	Έχω επαρκείς γνώσεις για να αξιολογήσω την ποιότητα των διαδικτυακών πηγών.	**3.02 (1.26)**	**3**	**−.395**	**−.448**	**.865**	**.73**	**.757**
31	I know how to use the Internet to get answers to my health concerns.	Γνωρίζω πώς να χρησιμοποιώ το διαδίκτυο για να πάρω απαντήσεις σε θέματα υγείας που με απασχολούν.	**3.33 (1.25)**	**4**	**−.701**	**−.013**	**.870**	**.68**	**.737**
24	I am able to distinguish low-quality health information from high-quality health information online.	Είμαι σε θέση να διακρίνω πληροφορίες για την υγεία χαμηλής ποιότητας από εκείνες υψηλής ποιότητας στο διαδίκτυο.	**3.25 (1.29)**	**3**	**−.760**	**.105**	**.873**	**.63**	**.640**
29	I know how to access websites or applications and enter my symptoms to get information about my health issues.	Γνωρίζω πώς να έχω πρόσβαση σε ιστοσελίδες ή εφαρμογές και να εισάγω τα συμπτώματα μου για να βρω πληροφορίες για τα θέματα υγείας μου.	**3.02 (1.34)**	**3**	**−.435**	**−.546**	**.879**	**.53**	**.629**
22	I know which sources of health information are available online.	Γνωρίζω ποιες πηγές πληροφοριών για την υγεία είναι διαθέσιμες στο διαδίκτυο.	**2.81 (1.24)**	**3**	**−.262**	**−.244**	**.881**	**.49**	**.496**
20	I fully understand health-related information I find online.	Κατανοώ απόλυτα τις πληροφορίες σχετικά με την υγεία που βρίσκω στο διαδίκτυο	**2.88 (1.11)**	**3**	**−.020**	**−.154**	**.880**	**.52**	**.476**
27	If I have doubts about the reliability of information about health online, I ask somebody for explanation.	Εάν έχω αμφιβολίες για την αξιοπιστία των πληροφοριών για την υγεία που βρίσκω στο διαδίκτυο, ζητάω από κάποιον να μου τις εξηγήσει.	**3.38 (1.28)**	**4**	**−.886**	**.243**	**.889**	**.39**	**.418**
8	I know how to use the information I find on the Internet to improve my health.	Γνωρίζω πως να χρησιμοποιήσω τις πληροφορίες που βρίσκω στο διαδίκτυο για να βελτιώσω την υγεία μου.	**3.4 (1.08)**	**4**	**−.732**	**.337**	**.880**	**.51**	**.400**
eHealsE2	**Understanding Information quality**								
19	I sometimes have difficulties understanding key information online that is relevant to my health. (R)	Μερικές φορές δυσκολεύομαι να κατανοήσω σημαντικές πληροφορίες για την υγεία μου που βρίσκω στο διαδίκτυο	**2.92 (1.17)**	**3**	**−.266**	**−.363**	**.818**	**.72**	**.797**
14	I often don't understand the terminology used by some online health sources. (R)	Συχνά δεν καταλαβαίνω την ορολογία που χρησιμοποιείται από ορισμένες διαδικτυακές πηγές για την υγεία	**2.98 (1.14)**	**3**	**−.175**	**−.570**	**.823**	**.66**	**.738**

(*Continued*)

Table 2. (Continued).

Items	English version	Greek version	Mean (SD)	Median	Skewness	Kurtosis	Cronbach if Item deleted	Corrected Item- Total Correlation	Factor loadings
16	I'm unable to recognize high-quality information relevant for my health because of the vast amount of information online. (R)	Δεν είμαι σε θέση να διακρίνω ποιες πληροφορίες για την υγεία μου είναι υψηλής ποιότητας λόγω του τεράστιου όγκου πληροφοριών που υπάρχουν στο διαδίκτυο.	**2.98 (1.16)**	**3**	**−.034**	**−.898**	**.825**	**.65**	**.728**
15	When reading information about health online, I take sufficient time to really understand it. (R)	Όταν διαβάζω πληροφορίες για την υγεία στο διαδίκτυο, χρειάζομαι αρκετό χρόνο να τις κατανοήσω σε βάθος/πραγματικά	**3.04 (1.14)**	**3**	**−.329**	**−.262**	**.826**	**.65**	**.700**
12	I sometimes don't know where to start searching online for information about health when I have a health problem. (R)	Μερικές φορές δεν ξέρω από πού να αρχίσω να ψάχνω στο διαδίκτυο πληροφορίες για την υγεία όταν έχω ένα πρόβλημα υγείας	**3.11 (1.11)**	**3**	**−.104**	**−.772**	**.835**	**.60**	**.580**
28	I can find a lot of health information online, but I can't identify the information that can help me make health decisions. (R)	Μπορώ να βρω πολλές πληροφορίες για την υγεία στο διαδίκτυο αλλά δεν μπορώ να διακρίνω τις πληροφορίες που μπορούν να με βοηθήσουν να πάρω σχετικές αποφάσεις	**2.83 (1.24)**	**3**	**−.227**	**−.501**	**.839**	**.57**	**.571**
23	There are medical studies published online, but I don't know how to access them. (R)	Υπάρχουν δημοσιευμένες ιατρικές μελέτες στο διαδίκτυο αλλά δεν γνωρίζω πως μπορώ να έχω πρόσβαση σε αυτές.	**2.87 (1.28)**	**3**	**−.301**	**−.427**	**.843**	**.53**	**.568**
10	I do not usually find personally useful information about health online. (R)	Συνήθως δεν βρίσκω στο διαδίκτυο πληροφορίες για την υγεία που να μου είναι προσωπικά χρήσιμες.	**3.14 (1.07)**	**3**	**−.587**	**.137**	**.850**	**.45**	**.463**
eHealsE3	**Smart on the Net**								
4	I am satisfied with the first health source found on the Internet that provides answers to my questions. (R)	Είμαι ικανοποιημένος/η με την πρώτη πηγή σχετικά με την υγεία που βρίσκω στο διαδίκτυο που απαντάει στις ερωτήσεις μου.	**3.72 (.99)**	**4**	**−.713**	**.642**	**.682**	**.63**	**.726**
3	I think we can trust most of the health information found online. (R)	Πιστεύω ότι μπορούμε να εμπιστευτούμε τις περισσότερες πληροφορίες για την υγεία που βρίσκουμε στο διαδίκτυο	**3.7 (.98)**	**4**	**−.834**	**1.10**	**.696**	**.58**	**.681**
5	When searching online, I prefer to read short and simple health explanations rather than comprehensive professional explanations. (R)	Κατά την αναζήτηση στο διαδίκτυο, προτιμώ να διαβάζω σύντομες και απλές εξηγήσεις για την υγεία μου παρά πιο λεπτομερείς επαγγελματικές εξηγήσεις.	**3.24 (1.24)**	**3**	**−.158**	**−.861**	**.723**	**.47**	**.587**
6	Modern online systems are so highly developed that they automatically differentiate between low- and high-quality health information. (R)	Τα σύγχρονα διαδικτυακά συστήματα είναι τόσο αναπτυγμένα που διακρίνουν αυτόματα μεταξύ χαμηλής και υψηλής ποιότητας πληροφορίας για την υγεία.	**3.17 (1.24)**	**3**	**−.790**	**.496**	**.736**	**.44**	**.522**
9	A large number of followers (of a person or an organization) on social media is a proof, that information posted online is professionally reliable. (R)	Ο μεγάλος αριθμός ακολούθων (κάποιου ατόμου ή οργανισμού) στα μέσα κοινωνικής δικτύωσης αποδεικνύει ότι οι πληροφορίες που αναρτώνται στο διαδίκτυο είναι αξιόπιστες.	**3.73 (1.07)**	**4**	**−.896**	**.901**	**.726**	**.46**	**.494**

(*Continued*)

Table 2. (Continued).

Items	English version	Greek version	Mean (SD)	Median	Skewness	Kurtosis	Cronbach if Item deleted	Corrected Item- Total Correlation	Factor loadings
13	If I find useful information on health online, I am not interested in who the author is. (R)	Εάν βρω χρήσιμες πληροφορίες για την υγεία στο διαδίκτυο δεν με ενδιαφέρει ποιος τις έχει γράψει	**3.98 (1.08)**	**4**	**−1.14**	**1.02**	**.737**	**.42**	**.447**
eHealsE4	**Accessibility and Validity of Information**								
18	When I find information related to my health online, I check its accuracy with other online sources.	Όταν βρίσκω πληροφορίες που σχετίζονται με την υγεία μου διαδικτυακά, ελέγχω την ακρίβεια τους με άλλες διαδικτυακές πηγές.	**3.56 (1.27)**	**4**	**−.961**	**.427**	**.408**	**.50**	**.533**
7	It is very important for me to have access to health-related sources online.	Είναι πολύ σημαντικό για μένα να έχω πρόσβαση σε πηγές σχετικά με την υγεία στο διαδίκτυο.	**3.47 (1.1)**	**4**	**−.778**	**.444**	**.615**	**.35**	
21	It is important for me to check health-related information that I find online with other sources (for example doctors, books, friends, relatives).	Είναι σημαντικό για μένα να ελέγχω τις πληροφορίες σχετικά με την υγεία που βρίσκω στο διαδίκτυο με άλλες πηγές (π.χ. από ιατρούς, βιβλία, φίλους, συγγενείς)	**3.67 (1.39)**	**4**	**−.1.12**	**.535**	**.497**	**.44**	**.408**
	Perceived Efficiency								
1	I feel confident about using the Internet to improve my health.	Νιώθω σίγουρος/η να χρησιμοποιώ το διαδίκτυο για να βελτιώσω την υγείας μου.	**2.95 (1.03)**	**3**	**.029**	**−.355**	–	**.67**	**.468**
2	The Internet is very useful for helping me to take decisions about my health.	Το διαδίκτυο είναι πολύ χρήσιμο να με βοηθάει να παίρνω αποφάσεις για την υγεία μου	**2.55 (1.04)**	**2**	**.279**	**−.215**	–	**.67**	**.424**

Table 3. E-heals descriptive statistics.

Items	English version	Greek version	Mean (SD)	Median	Skewness	Kurtosis	Cronbach if Item deleted	Corrected Item – Total Correlations	Factor loadings
	Awareness of resources								
eHeals 2	I know where to find helpful health resources on the Internet	Γνωρίζω που να αναζητήσω στο διαδίκτυο χρήσιμες πληροφορίες για θέματα υγείας.	3.33 (.90)	**3**	−.319	−.460	.845	.74	**.818**
eHeals 3	I know how to find helpful health resources on the Internet	Γνωρίζω πώς να αναζητήσω στο διαδίκτυο χρήσιμες πληροφορίες για θέματα υγείας.	3.48 (.89)	**4**	−.830	−477	.767	.82	**.812**
eHeals 4	I know how to use the Internet to answer my questions about health	Γνωρίζω πώς να χρησιμοποιήσω το Διαδίκτυο για να βρω απαντήσεις σε ερωτήσεις μου που αφορούν την υγεία	3.48 (.84)	**4**	−.833	.293	.854	.73	**.792**
	Evaluation								
eHeals 6	I have the skills I need to evaluate the health resources I find on the Internet	Έχω τις δεξιότητες που χρειάζομαι για να αξιολογήσω πληροφορίες που βρίσκω στο Διαδίκτυο για θέματα υγείας.	3.22 (.98)	**3**	−.553	−.390	.636	.51	**.832**
eHeals 7	I can tell high quality health resources from low quality health resources on the Internet	Μπορώ να διακρίνω στο Διαδίκτυο πληροφορίες υψηλής ποιότητας για την υγεία από πληροφορίες χαμηλής ποιότητας.	3.30 (.98)	**4**	−.655	−.110	.657	.50	**.823**
eHeals 8	I feel confident in using information from the Internet to make health decisions	Νιώθω σίγουρος/η να χρησιμοποιήσω πληροφορίες στο Διαδίκτυο για να πάρω αποφάσεις σχετικές με την υγεία μου.	2.68 (1.10)	**3**	.029	−.717	.817	.27	**.509**

Table 4. Psychometric properties of the eHeals and eHeals-E.

	Cronbach alpha	Mean Item-Total correlation	Mean Inter-Item Correlation
eHeals			
Awareness of resources	.88	.76	.70
Evaluation	.78	.623	.549
Total	.91	.684	.547
eHeals-E			
EhealsE1_Awareness resources and recognizing quality	.89	.643	.411
EhealsE2_Understanding Information	.85	.60	.428
EhealsE3_Smart on the Net	.75	.497	.344
EhealsE4_Accessibility and Validity of Information	.62	.429	.348
EhealsE5_Perceived Efficiency	.80	.67	.67

The dimensionality of eHeals-E-GR and eHeals-GR

The exploratory factor analysis with varimax rotation provided five factors for the eHeals-E-GR. The sample size was adequate according to the measure of Kaiser-Meyer-Olkin sampling (.92) and Bartlett's Test of Sphericity ($p > .0001$). The first factor "awareness resources and recognizing quality" explained 24% of the variance and included nine items (30, 25, 32, 26, 31, 24, 29, 22, 20, 27, 8), the second factor "Understanding information" explained 14% of the variance and included seven items (19 R, 14 R, 16 R, 15 R,12 R, 28 R, 23 R, 10 R), the third factor explained 8% of the variance and included four items "Smart on the Net" (4 R, 3 R, 5 R, 6 R, 9 R, 13 R) the fourth, "validation of information" explained 4% of the variance with three items (18, 7,21) and the fifth "perceived efficiency" explained 4% of the variance with two items (1, 2). Items 11 and 17 did not load in any factors (loadings below .30).

The confirmatory factor analysis of eHeals GR provided a statistically significant chi-square (x2 = 119.813, df = 19, $p < .001$), CFI = .948, TLI = .923, RMSEA = .11, SRMR = .045. Modification indices were calculated and two items (Item 1 and 5) had a high correlation with item 2 and item 4, respectively. When these two items (1 and 5) were excluded, the model improved even though the x^2 remained statistically significant ($\chi 2 = 20.317$, df = 8, $p < .009$), CFI = .99, TLI = .98, RMSEA = .062, SRMR = .025.

Internal consistency

High Cronbach's alphas were found for the overall eHeals-GR and its subscales: eHeals total (α = 91), eHeals1 "awareness" (α = 88), eHeals2 "evaluation" (α = 78) (Table 4). Medium to high Cronbach's alphas were found for the five factors of eHeals-E-GR (.62–.89; Table 2). The overall internal consistency of eHeals-E-GR was satisfactory (Cronbach a = .80).

Item-total and inter-scale correlations for eHeals-GR and eHeals-E-GR

Corrected item-total correlations and the mean item-total correlations were over .30 in the case of all items for both scales (Tables 2–4). Mean inter-item correlations for eHeals-GR were higher than the suggested range (.15–.50) by Clark & Watson.[27] The eHeals-E-GR had lower mean inter-item correlations in comparison with the eHeals-GR and within the accepted range according to Clark & Watson for four out of the five factors. The eHeals-E5 "perceived efficiency" had a mean inter-item correlation of over .50 (Table 5). Detailed inter-item correlations are presented in Table 5.

The inter-scale correlations of eHeals-GR ranged from medium to high positive correlations ($r = .40$ to .75, mean = .55). The factor "awareness" (eHeals1) and "evaluation" (eHeals2) had high correlations with the eHeals total score (Table 6).

Table 5. Inter-item correlations of eHeals and eHeals-E.

Factors	Items	8	22	20	24	25	26	27	29	30	31	32
eHeals-E1	8	–	.									
	22	.36	–									
	20	.36	.47	–								
	24	.37	.33	.37	–							
	25	.33	.38	.43	56	–						
	26	.45	.43	.42	.57	.67	–					
	27	.26	.12	.17	.38	.35	.30	–				
	29	.27	.31	.28	.30	.44	.38	.28	–			
	30	.36	.33	.37	.46	.58	.54	.31	.51	–		
	31	.38	.31	.35	.42	.54	.53	.28	.48	.68	–	
	32	.39	.38	.43	.55	.57	.63	.32	.44	.60	.60	–
		10	12	14	15	16	19	23	28			
eHeals-E2	10	–										
	12	.36	–									
	14	.35	.44	–								
	15	26	.44	.63	–							
	16	.37	.46	.56	.52	–						
	19	.34	.49	.59	.62	.52	–					
	23	28	.39	.34	.34	.35	.51	–				
	28	.31	.42	.35	.42	.44	.45	.45	–			
		3	4	5	6	9	13					
eHeals-E3	3	–										
	4	.59	–									
	5	.29	.41	–								
	6	.36	.36	.34	–							
	9	.40	.35	.31	.24	–						
	13	.30	.36	.27	.23	.30	–					
		7	18	21								
eHeals-E4	7	–										
	18	.34	–									
	21	.26	.45	–								
		1	2									
eHeals-E5	1	–										
	2	.67	–									
		2	3	4								
eHeals Awareness	2	–										
	3	.75	–									
	4	.62	.73	–								
		6	7	8								
eHeals Evaluation	6	–										
	7	.69	–									
	8	.49	.47	–								

Table 6. Inter-scale correlations.

Factors	eHeals-E1	eHeals-E2	eHeals-E3	eHeals-E4	eHeals-E5	eHeals-E Total	eHeals1	eHeals2	eHeals Total
eHeals-E1	–								
eHeals-E2	.11*	–							
eHeals-E3	−.30**	.20**	–						
eHeals-E4	.58**	−.10	−.22**	–					
eHeals-E5	.49**	.10	−.47**	.41**	–				
eHeals1	.55**	.21**	−.15**	.39**	.44**	.56**	–		
eHeals2	.53**	.27**	−.22**	.33**	.53**	.55**	.66**	–	
eHeals Total	.59**	.27**	−.21**	.39**	.53**	.61**	.91**	.92**	–
HLS-EU-Q16	.24**	.25**	−.05	.13*	.17**	.31**	.39**	.35**	.41**

* p<.05 , ** p <.01

The inter-scale correlations among the five factors of eHeals-E-GR ranged from low to medium positive (Table 6). Factor eHeals-E1 "awareness resources and recognising quality" had a medium positive correlation with factors eHeals-E4 "accessing and validating information" and eHeals-E5 "perceived efficiency ($r = .58$, $r = .49$, respectively). The factor eHeals-E2 "understanding" correlated only with the total score. The factor eHeals-E3 "Smart on the Net" had low negative correlations with eHeals-E1, eHeals-E4, and eHeals-E5 and low positive correlation with eHeals-E2. The factor eHeals-E4 "accessing and validating information" had a low positive correlation with eHeals-E5 "perceived efficiency."

The eHeals-E-GR had medium to high positive correlations with all factors except the eHeals-E3 "Smart on the Net.

Convergent and divergent validity

There was a medium positive correlation between the total scores of the two eHealth Literacy scales ($r = .61$). The total score of the eHeals-E-GR had a medium positive correlation with the two eHeals-GR subscales (eHeals1 awareness and eHeals2 evaluation).

The factors eHeals-E1 "awareness and quality" and eHeals-E5 "perceived efficiency" had medium positive correlations ($r = .59$, $r = 53$) with the eHeals total score. The eHeals-E1 "awareness and quality" correlated with the eHeals1 "awareness" ($r = .55$). The eHeals-E5 "perceived efficiency" had a positive medium correlation with the eHeals2 "evaluation" ($r = .53$).

The eHeals-E4 "accessing and validating information" had a low positive correlation with eHeals and its subfactors. The other two factors, eHeals-E2 "understanding online information and eHeals-E3 "Smart on the Net," had weak correlations below .27.

The HLS-EU-Q16 had positive low correlations with eHeals-Extended total score and eHeals total score ($r = .31$ and $r = .41$) (Table 4).

Discussion

The aim of the paper was to validate and compare the psychometric properties of the Greek version of eHeals and the revised eHeals-Extended scales that measure eHealth literacy. Both scales have demonstrated satisfactory psychometric properties providing high internal consistencies for most of the factors.

In this study, the eHeals validation provided good psychometric properties and confirmed the two factors ("raise awareness" and "evaluation") as were extracted in the validation and adaptation of the tool for carers of people with dementia in Greece.[19] Two items were excluded in the Greek validation of eHeals-GR: item 1 "I know what health resources are available on the Internet" and item 5 "I know how to use the health information I find on the Internet to help me" as they were associated with item 2 "I know where to find helpful health resources on the Internet" and item 4 "I know how to use the Internet to answer my questions about health."

Although eHeals scale is a widely used and validated instrument, eHealth Literacy researchers have expressed concerns as the questionnaire lacks items for assessing Web 2.0 and 3.0 dimensions.[10] The eHeals-E scale was initially developed in the Slovenian language and included items to address important aspects of Web 2.0, such as the skills to navigate the net, and to access and assess information on social media. The initial version of eHeals-E with 21 items was revised and extended with 11 new items.[16] The scientific team decided to proceed with the validation in Greek of the newly developed eHeals-E (32 items) and the final validated Greek version of the scale included 30 items. The two items "I am aware that search engines can return personalised and limited search results when I search for health-related information" and "I myself interpret health information that I find online" were excluded, as they did not load sufficiently to any of the five factors. The second item "I myself interpret health information that I find online" provided misleading results as in the Greek translation this could be perceived by the participants either as a positive indicator of a high level of eHealth

literacy or a negative indicator of a low level of eHealth literacy. The validation process extracted five factors instead of six as Petrič et al. have found,[15] described in the publication of the eHeals-E 21: "awareness resources and recognising quality," "Understanding information," "Smart on the Net," "accessibility and validity of information," and "perceived efficiency." The factor "awareness resources and recognising quality" loaded as one factor in our study instead of two (awareness resources and recognizing quality). The recent validation of Slovene eHeals-E scale revealed six factors, but these two factors (Awareness of sources and Recognizing quality and meaning) are similarly not well discriminated.[16] The second factor "Understanding information" included items focusing on the understanding of the resources. We kept the original name for the third factor ("Smart on the Net"), as the items were describing skills that are essential to effectively navigate the Internet and assess the information, for example: skills in relation to trust online information, quality of the content, importance to know the authors of the online content, how to assess the number of followers, browsers' criteria of ordering information. The third factor ("Smart on the Net") had negative correlations with almost all factors of the eHeals-E-GR. The fourth factor "accessibility and validity of information" included one item for the access of the information and two on validity. The fifth factor "perceived efficiency" included two items in relation to general self-efficacy in the use and the importance of the Internet.

The scales eHeals-GR and eHeals-E-GR had satisfactory reliability and mean item-total correlations. The inter-item correlations were close to the desired range of .15–.50 for eHeals-E-GR. Only four items of the first and fourth factor had inter-item correlations over .50. We did not exclude these items as doing so would decrease reliability as indicated by Cronbach's alpha if item deleted. The eHeals-GR had inter-item correlation scores over .60 in the case of the second factor and in one item of the first factor. Inter-item correlations over .60 might provide evidence that the items do not measure different dimensions of the concept and may overlap.

The awareness and quality factor of the eHeals-E-GR was correlated with the eHeals1 "awareness" and eHeals2 "evaluation." This was also the case for the factor "perceived efficiency" of the eHeals-E-GR and the eHeals2 "evaluation." The evaluation of the resources is covered by two factors in the case of the eHeals-E-GR version. The weak correlations between the two factors of the eHeals-E-GR with eHeals could be attributed to the fact that these skills were not included in the initial eHeals scale. The development of the eHeals-E-GR confirmed the theoretical framework presented by Norman & Skinner[18] and Bautista.[28] The five factors covered the skills to access, understand, validate/appraise, and apply[28] and extended the initial version of the eHeals with Web 2.0 items.

One drawback of this validation is the utilization of an English translation rather than the original Slovenian version. In order to address this issue, a meeting was scheduled with the developer of the original version while consistent communication via e-mails was maintained throughout the validation process to clarify any translation issues and to select the most appropriate methodology. Additionally, the small and convenient sample size is considered another limitation. The majority of the participants were highly educated, and the data cannot be used to draw conclusions per age group. The cross-sectional study design limits insights into how eHealth literacy evolves over time, implying that a longitudinal strategy may be preferable. Furthermore, the omission of specific items due to cultural or language challenges highlights the need for more sophisticated cultural adaptation procedures, such as cognitive interviews or focus groups, to guarantee the scale is better suited to the Greek culture.

Future studies should also consider revising the items with inter-item correlations over .50, as they might depict overlapping concepts and include more items related to Web 3.0, given the rapid pace of technological advancements. Future research could focus on the cultural adaptations and validation in different population groups (migrants, people with chronic diseases), different age groups, and different languages ensuring representation across education, socioeconomic status, and age. The Slovenian version of the eHeals-E demonstrated measurement equivalence across sociodemographic groups, suggesting that the scale can be used on different populations. At the moment, the generalizability of the eHeals-E-GR is limited since only the Slovenian and Greek version are culturally adapted and validated. Validation in an English-speaking sample would increase its usefulness and applicability.

In conclusion, the validation and comparison of these two eHealth literacy scales is considered valuable for clinical and academic work. The eHeals-E-GR could be considered as an updated version of the eHeals-GR, covering different aspects of Web 2.0 and 3.0 and following the theoretical framework of the eHeals as presented by Norman & Skinner.[7] In both cases, these two tools are addressed to people who already use technology. The eHeals-E-GR is inherently designed for individuals who are using Internet-based services for health-related information seeking. However, technical inequities, such as limited access to Internet and devices, and varying levels of digital literacy and experience with digital tools may affect its use and validity.

Since technology is progressing, the original scale of Norman, eHeals, even though it has been a widely used instrument for the last two decades, should be used consciously as it lacks items assessing basic aspects of Web 2.0 and 3.0. eHeals-E includes items pertaining to the technological advancements and could be used by researchers when they wish to focus in detail on the eHealth Literacy level of a population. If researchers need a brief tool, then eHeals could serve as a suitable choice. In clinical practice, the measurement of the eHealth literacy level with eHeals-E can facilitate the development of appropriate interventions for healthcare professionals to enhance the required skills and promote eHealth. Furthermore, in case practitioners require an easy and short questionnaire for everyday practice, eHeals scale could play that role. By incorporating the eHeals-E scale into daily practice, healthcare professionals and institutions can more effectively assist patients in using digital health resources, ultimately leading to improved health outcomes. For example, hospitals integrating the scale into their standard intake process will facilitate healthcare professionals to assess patients' digital health literacy levels; patients with low levels could be provided with additional support and resources and will receive tailored instructions and care plans.

Acknowledgments

We would like to thank, the translators, Ms Marirena Pagaki, Ms Anka Davila, Dr Aikaterini Fragopoulou, Dr Eleni Margioti and the experts team assessed the content validity of the scales.

Disclosure statement

No potential conflict of interest was reported by the author(s).

Funding

This work was supported by the Hellenic Mediterranean University as part of a postdoctoral research fellowship of the first author under the [Grant number 67NH46MH2I-IΛ7].

ORCID

Areti Efthymiou http://orcid.org/0000-0001-8838-1669
Argyroula Kalaitzaki http://orcid.org/0000-0002-6416-9740
Michael Rovithis http://orcid.org/0000-0003-0471-0117
Gregor Petrič http://orcid.org/0000-0001-5975-5318

References

1. Brørs G, Norman CD, Norekvål TM. Accelerated importance of eHealth literacy in the COVID-19 outbreak and beyond. Eur J Cardiovasc Nurs. 2020;19(6):458–61). SAGE Publications Inc. doi:10.1177/1474515120941307.
2. Neubeck L, Hansen T, Jaarsma T, Klompstra L, Gallagher R. Delivering healthcare remotely to cardiovascular patients during COVID-19: a rapid review of the evidence. Eur J Cardiovasc Nurs. 2020;19(6):486–94). SAGE Publications Inc. doi:10.1177/1474515120924530.

3. World Health Organisation. Classification of digital health interventions V 1.0. 2018. https://iris.who.int/bitstream/handle/10665/260480/WHO-RHR-18.06-eng.pdf?sequence=1.
4. World Health Organization. Health literacy the solid facts. World Health Organisation Regional Office for Europe; 2013. https://apps.who.int/iris/bitstream/handle/10665/128703/e96854.pdf.
5. Kritsotakis G, Andreadaki E, Linardakis M, Manomenidis G, Bellali T, Kostagiolas P. Nurses' ehealth literacy and associations with the nursing practice environment. Int Nurs Rev. 2021;68(3):365–371. doi:10.1111/nr.12650.
6. Xesfingi S, Vozikis A. eHealth literacy: In the quest of the contributing factors. Interact J Med Res. 2016;5(2):e16. doi:10.2196/ijmr.4749.
7. Norman CD, Skinner HA. eHEALS: the eHealth literacy scale. J Med Internet Res. 2006;8(4):1–7. doi:10.2196/jmir.8.4.e27.
8. Efthymiou A, Middleton N, Charalambous A, Papastavrou E. Adapting the eHealth literacy scale for carers of people with chronic diseases (eheaLS-cArer) in a sample of Greek and Cypriot carers of people with dementia: reliability and validation study. J Med Internet Res. 2019;21(11):e12504. doi:10.2196/12504.
9. Lee J, Lee EH, Chae D. eHealth literacy instruments: systematic review of measurement properties. J Med Internet Res. 2021;23(11):e30644. JMIR Publications Inc. doi:10.2196/30644.
10. Norman C. eHealth literacy 2.0: problems and opportunities with an evolving concept. J Med Internet Res. 2011;13(4):2–5. doi:10.2196/jmir.2035.
11. Delgado H. Web 2.0 history, evolution and characteristics. 2019 [accessed 2024 Nov 3]. https://Disenowebakus.Net/En/Web-2.
12. Aziz HA, Madani A. Evolution of the web and its uses in healthcare. Clin Lab Sci Clin Lab Sci. 2015;28(4):245–49. https://clsjournal.ascls.org/content/ascls/28/4/245.full.pdf.
13. Goble C, Corcho O, Alper P, De Roure D. E-science and the semantic web: a symbiotic relationship. In: Todorovski L, Lavrač N Jantke KP, editors. Discovery science. DS2006. Lecture notes in computer science. Vol. 4265. Springer; 2006. p. 1–12. www.mygrid.org.uk.
14. Liu HX, Chow BC, Liang W, Hassel H, Huang YJW. Measuring a broad spectrum of eHealth skills in the web 3.0 context using an eHealth literacy scale: development and validation study. J Med Internet Res. 2021;23(9):e31627. doi:10.2196/31627.
15. Petrič G, Atanasova S, Kamin T. Ill literates or illiterates? Investigating the eHealth literacy of users of online health communities. J Med Internet Res. 2017;19(10):e331. doi:10.2196/jmir.7372.
16. Petrič G, Atanasova S. Validation of the extended e-health literacy scale: structural validity, construct validity and measurement invariance. BMC Public Health. 2024;24(1). doi:10.1186/s12889-024-19431-8.
17. Efthymiou A, Kalaitzaki A, Rovithis M. Cultural adaptation of a health literacy toolkit for healthcare professionals working in the primary care setting with older adults. Healthcare (Switz). 2023;11(5). doi:10.3390/healthcare11050776.
18. Norman CD, Skinner HA. eHealth literacy: essential skills for consumer health in a networked world. J Med Internet Res. 2006;8(2):e9. doi:10.2196/jmir.8.2.e9.
19. Efthymiou A, Middleton N, Charalambous A, Papastavrou E. Adapting the eHealth literacy scale for carers of people with chronic diseases (eHeals-carer) in a sample of Greek and Cypriot carers of people with dementia: reliability and validation study. J Med Internet Res. 2019;21(11):e12504. doi:10.2196/12504.
20. Lee J, Lee EH, Chae D. eHealth literacy instruments: systematic review of measurement properties. J Med Internet Res. 2021;23(11). JMIR Publications Inc. e30644. doi:10.2196/30644.
21. HLS-EU CONSORTIUM. Comparative report on health literacy in EIght EU member states (Second revised and extended version. The European Health Literacy Survey HLS-EU (second revised and extended version, date july 22th, 2014). 2012. Online publication. http://www.health-literacy.eu.
22. Efthymiou A, Middleton N, Charalambous A, Papastavrou E. Health literacy and eHealth literacy and their association with other caring concepts among carers of people with dementia: a descriptive correlational study. Health Soc Care Comm. 2021;(3):1109–19. doi:10.1111/hsc.13341.
23. Polit D, Beck C. The content validity index: are you sure you know what's being reported? Critique and recommendations. Res Nurs Health. 2006;29(5):489–97. doi:10.1002/nur.20147.
24. Mchorney CA, Tarlov AR. Individual-patient monitoring in clinical practice: are available health status surveys adequate? Qual Life Res. 1995;4(4):293–307. doi:10.1007/BF01593882.
25. Hooper D, Coughlan J, Mullen MR. Structural equation modelling: guidelines for determining model fit. Electron J Bus Res Methods. 2008;6:53–60. https://arrow.tudublin.ie/cgi/viewcontent.cgi?article=1001&context=buschmanart.
26. Cristobal E, Flavián C, Guinalíu M. Perceived e-service quality (PeSQ). Managing Service Qual: An Int J. 2007;17(3):317–40. doi:10.1108/09604520710744326.
27. Clark LA, Watson D. Constructing validity: basic issues in objective scale development. Psychological Assess. 1995;7(3):309–19. doi:10.1037/1040-3590.7.3.309.
28. Bautista JR. From solving a health problem to achieving quality of life: redefining eHealth literacy. J Lit Technol. 2015;16(2):33–54. http://www.literacyandtechnology.org/uploads/1/3/6/8/136889/jlt_v16_2_bautista.pdf.