Everyday Health Information Literacy and Attitudes towards Digital Health Services among Finnish Older Adults

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Abstract. Everyday health information literacy (EHIL) denotes people's confidence and perceptions of their capability to obtain, evaluate, and use health information in everyday life. This paper presents results from a survey of older Finns on how EHIL relates to perceptions of digital health services. A postal survey was conducted with a random sample of 1,500 Finns aged 55-70 years. In total, 373 completed surveys (25%) were returned. We used an adapted screening tool to measure EHIL and subject position scales to indicate attitudes towards digital health services. The data were analysed using PLS-SEM in SmartPLS 3.0. The analysis suggested that EHIL is positively related to more positive attitudes to digital health services and negatively to more negative attitudes to such services. The results emphasise the importance of EHIL as an enabler of the acceptance of digital health services. The study also introduces new methods for analysing EHIL.

Keywords: Digital health services, eHealth, everyday health information literacy, Finland, health literacy, older adults, seniors.

1   Introduction

An essential premise of maintaining good health is to manage health information. Health literacy is a commonly used concept to describe a person's ability to obtain, process, understand, and use health information [1]. Its main difference to information literacy, besides its focus on health, is that while health literacy focuses more on interactive communication, information literacy is about competencies to discover and seek information [2]. The Medical Library Association in the US combined health literacy and information literacy to the concept of health information literacy, which covers the abilities to recognize a need for health information, to know how and where to find information about health, and to evaluate and use this information in everyday life to make good health decisions [3]. Health information literacy is often examined in either library or educational contexts (e.g. [4–6]). However, Yates [7] used the concept in a more general sense as using information to learn about health. The focus of information literacy research has more recently changed, and health information literacy is nowadays conceptualised in a broader sense in everyday life settings, as well [8].

This paper presents results from a survey study on older adults in Finland and sheds light on the relationship between everyday health information literacy (EHIL) and attitudes towards digital health services. Previous studies have examined the EHIL of older adults in different countries [9–11]. In addition, recent surveys conducted both in Finland [12] and other Nordic countries (e.g. [13, 14]), have studied the use of and attitudes toward national patient-accessible electronic health records, in particular. However, to the best of our knowledge, no earlier studies exist on older adults' attitudes to digital health services in relation to EHIL. Another novel aspect of this study is to analyse EHIL using structural equation modelling.

2   Health (Information) Literacy and Digital Health Information Behaviour

Studies have examined either health literacy or health information literacy and their relations to health information behaviour, especially in the digital environment. Inadequate levels of health literacy have been linked to less frequent use of the internet as a source for health information among older adults [15], whereas adequate levels of health literacy often are related to more frequent seeking of health information online [16], as well as to the use of health information technology including applications, activity trackers and patient portals [17].

The related concept eHealth literacy is used specifically in the context of digital information [18]. Paige et al. [19] studied eHealth literacy in different age groups, and found that older adults had lower confidence in their abilities to recognize, acquire and use eHealth resources and information than younger adults had. Among older adults, barriers to seeking online health information may include limited computer skills, not knowing which information sources are reliable, and lack of confidence in one's own

ability to evaluate and apply electronic health information [20].

A review shows that studies link lower health literacy to less frequent use of health web portals [21]. According to another review, health literacy or the capacity to interpret health information is a factor that influences the use of patient portals or personally controlled electronic health records [22]. Moreover, low health literacy has often been found to be a barrier to the use of personal health records (e.g. [23, 24]), whereas higher levels of health literacy are linked to the adoption of these services [25]. Irizarry et al. [26] found, however, that although health literacy was related to higher confidence in assessing and evaluating online health information among older adults, it was not directly related to the interest in using patient portals. Enwald et al. [9], for their part, studied elements of EHIL and found a link between higher confidence in the abilities to evaluate and understand health information and the use of traditional and mobile information technology.

3   Older Adults and Digital Health Services

A review of research on older adults' perceptions of eHealth services showed that electronic health information could be used for a variety of purposes including health management, social uses, and personal health information management [27]. In a review of studies on the patient portal use of persons aged 60 years or older, the main barriers of the use of both patient portals and electronic personal health records were issues related to privacy and security, and the access and ability to use information and communication technologies (ICT) [28]. In a Norwegian survey, respondents 65 years or older used a patient-accessible electronic health service to a lower degree than younger ones did [14]. According to a Finnish survey of people aged 65 to 90 years, those under 75 years considered their ICT skills as good and they were more ready to use digital social and health services and technology, whereas those 75 years or older considered their technology skills as fair or poor. As many as 78%, however, thought that they usually manage to get things solved in digital services, and 88% partly or totally agreed that digital services are useful [12]. In a Swedish survey, those aged 66 years and older considered information in digital health services as useful and they were likely to understand it, but perceived technology difficult to use [13].

In studies on attitudes towards digital health services, Young et al. [29] found that the lack of knowledge about electronic health records and unwillingness to change current practices, for example, due to aversions against computers, acted as barriers to use of home-based health information technology among older adults. Older adults who were more positive about the benefits of eHealth services often had at least some experience of digital tools, whereas those who had only a little or no experience, had aversions towards such services [30]. Among older adults with chronic pain in Scotland, eHealth services were considered to serve as a supplement to personal appointments [31].

Older adults are found to value easy access to information about health, more direct communication with health providers, and the possibility to make appointments online [32]. In a study among Finnish older adults, saving time and not being dependent on

location were also considered important. Barriers to use of digital social and health services included a wish to meet the service provider in person and the perception that things are better taken care of in person. The older adults also had trust issues especially connected to privacy [12]. Dutch older adults, on their hand, liked to review their medical record information and check appointments, but experienced difficulties with the interaction and annoyances with, among others, lack of timely reactions to inquiries from the patient [33].

4   Research Questions and Hypotheses

This study addresses the following two research questions and, based on earlier research, we formulate three hypotheses:

A) Is there a relationship between the EHIL of older Finnish adults and their attitudes towards digital health services?
We pose the following hypothesis:
      H1. EHIL is strongly associated with attitudes towards digital health services.

B) What does a possible relationship between EHIL and attitudes to digital health services look like?
Here we formulate the following two hypotheses:
      H2. EHIL has a positive association with being more optimistic about digital health services being beneficial to use.
      H3. EHIL has a negative association with being more pessimistic about digital health services being beneficial to use.

5   Methodology

We mailed postal surveys to a random sample of 1,500 Finns aged 55-70 years, drawn from the national Population Information System [34], and received 373 completed surveys (25%). The total number of people in Finland aged 55-70 years was 1,158,529 in the end of 2019. This constitutes 21% of the total population of 5,525,292 [35]. The survey contained sections on, among others, health information behaviour and use of, and attitudes towards digital health services. The demographic characteristics of the respondents are shown in Table 1.

A five-point likert scale was used to measure all constructs in this study. Subject positions were measured using scales adapted from Huvila et al. [36]. We measured EHIL using an adapted version of the EHIL screening tool developed by Niemelä et al. [37]. The EHIL scale has been the most extensively used health information literacy test so far. It has been applied on different populations, including a variety of age groups and nationalities (e.g. [9–11], [37–40]). EHIL is operationalized as a multidimensional

construct, which has three dimensions, namely, Motivation, Confidence and Evaluation. Appendix A shows the measurement items.

Partial least square structural equation modelling (PLS-SEM) was used to test the relationship between EHIL and optimistic (positive) and pessimistic (negative) subject positions relating to digital health services. PLS-SEM is a multivariate technique. It is particularly useful for testing exploratory relationships and hierarchical models, as is the case in this study [41]. The analysis was conducted using PLS-SEM with SmartPLS 3.0. Following the guidelines given by Hair et al. [42], the measurement model is analysed before the structural model.

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Table 1. Demographic profile of respondents (n=373)

Items	%
Age	
55-59	27.1
60-64	28.2
65-69	33.5
70 & above	11.1
Education	
Elementary school	21.4
Upper secondary	34.5
Polytechnic or institute level degree	22.2
University degree	20.0
Licentiate or doctoral degree	1.9
Gender	
Male	38.8
Female	60.6

6 Results

6.1 Measurement Model

The measurement model includes assessment of the construct reliability (internal consistency reliability, indicator reliability) and validity (convergent validity, discriminant validity) of the used measures. Table 2 provides the measurement statistics. As is apparent from the table, indicator loadings of all the constructs are above the threshold value of 0.60, which confirms indicator reliability. Internal consistency reliability is also established as composite reliability values of all the constructs in the model are above the recommended value of 0.70 [42].

Average variance extracted (AVE) was used to assess the convergent validity of the constructs. As shown in Table 2, AVE values of all the constructs are above the acceptable value of 0.50. Discriminant validity was tested using the Fornell and Larcker criterion. Table 3 shows that the square root of AVE of each construct is higher than its correlation with other constructs. It fulfils the Fornell and Larcker criterion [43] required to establish discriminant validity. Overall, the results summarized in Tables 2 and 3 provide sufficient evidence of reliability and validity of the measurement scales used in this study.

EHIL was operationalized as a second order hierarchical construct. The "degree of explained variance of a hierarchical construct is reflected in its components" [44, p.110], which, in this case, is motivation (53 %, $p < 0.01$), confidence (61 %, $p < 0.01$) and evaluation (51 %, $p < 0.01$). Moreover, composite reliability and AVE values of EHIL are 0.79 and 0.56, which are above the recommended values.

Table 2. Measurement statistics of first-order constructs

	Mean	Standard deviation	Indicator loading	Composite reliability	AVE
EHIL Motivation				0.79	0.55
Item 1	4.18	0.64	0.61		
Item 2	3.93	0.84	0.82		
Item 3			0.77		
EHIL Confidence				0.78	0.54
Item 1	3.98	0.89	0.71		
Item 2	3.56	1.17	0.70		
Item 3			0.80		

EHIL Evaluation				0.81	0.58
Item 1	3.33	0.96	0.77		
Item 2	3.67	0.83	0.72		
Item 3	3.85	0.85	0.80		
Optimistic Subject Position				0.91	0.72
Item 1	4.25	0.69	0.80		
Item 2	4.31	0.62	0.88		
Item 3	3.83	0.92	0.86		
Item 4	4.18	0.83	0.86		
Pessimistic Subject Position				0.79	0.66
Item 1	4.03	0.77	0.66		
Item 2	3.97	0.78	0.94		

Table 3. Intercorrelations of the latent variables

	Confidence	Evaluation	Motivation	Pessimistic Subject Position	Optimistic Subject Position
Confidence	**0.732**				
Evaluation	0.377	**0.764**			
Motivation	0.369	0.254	**0.743**		
Pessimistic Subject Position	-0.474	-0.194	-0.363	**0.813**	
Optimistic Subject Position	0.257	0.11	0.32	-0.316	**0.85**

6.2   Structural Model

After assessing the measurement model, the relationship between EHIL and optimistic and pessimistic subject positions was analysed using standardized path coefficients and significance levels. The results are presented in Fig. 1. As shown in the figure, EHIL has a positive significant impact on optimistic subject position relating to digital health record services (β= 0.31, p < 0.01). Hence, hypothesis 2 is confirmed. Nevertheless,

EHIL has a very strong negative impact on pessimistic subject position relating to digital health record services (β= -0.47, p < 0.01), which substantiates our third hypothesis. The significant effect (p < 0.01) of EHIL on both optimistic and pessimistic subject positions also confirms the first hypothesis.
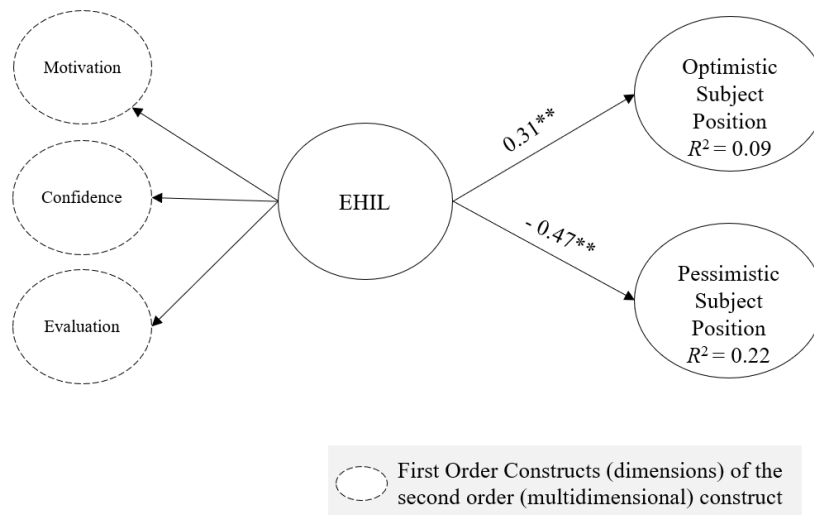

Fig. 1. PLS analysis results. Notes: **p < 0.01 (two-sided test)

7   Discussion and Conclusions

This study used structural equation modelling to analyse the relationship between EHIL and optimistic (positive) and pessimistic (negative) attitudes towards digital health services in a sample of older adults in Finland. In contrast to many earlier studies, the strength of the present study is the use of a population-based random sample. However, both due to the non-response bias and the fact that the sample represents Finnish older adults, there are limits to the degree of how the findings can be generalized to other age groups. In future research, the sample size could be expanded. Although extensive surveys indicate that users of patient-accessible electronic health records are generally content and do not experience major difficulties with access [12–14], especially older adults have shown lower confidence in their abilities to use electronic health resources [19]. Studies on health literacy, understood as the ability to obtain, process, understand, and use health information [1] and eHealth literacy [18], have also indicated that people's beliefs in their own capacity are strongly linked to the use of eHealth resources, including patient portals and patient-accessible electronic health records or personal health records [17], [22–25]. Our results are in line with these studies, as also EHIL is linked to attitudes towards digital health services and the three hypotheses are

confirmed.

A successful use of digital health services can depend on understanding the information and being confident about the use. Freise et al. [45] found that barriers to understanding electronic health record information are related to information in the form of difficulties in understanding terminology and interpretation of test results, as well as technology in the form of portal layout and accessibility as well as presentation of results. Previous studies using the EHIL screening tool show that older adults experienced more difficulties than younger ones in understanding terminology, as well as were less likely to compare information from different sources [10]. Enwald et al. [9] examined EHIL of Finns aged 65 or older and found that around 60% had trouble knowing who to believe in health issues and how to understand terminology. In our study, the variables Confidence (including understanding of health information) and Evaluation (covering ability to assess trustworthiness) were strongly linked to optimism on the benefits of using digital health services. Our results thus bring new knowledge about the importance of EHIL as an enabler of acceptance of digital health services.

The study also introduces a new method for analysing EHIL survey data. Previous studies of EHIL have analysed their results using different statistical methods including correlation analyses [37], factor analysis [37–39], ANOVA [10], [37], [39] and chi-square tests [9], [37], [40]. Our study shows that also PLS-SEM, which is a second-generation statistical technique, is particularly useful for building and operationalizing EHIL as a multidimensional construct. By using this method, we identified three variables that were very close to, and hence named in similar fashion as the three factors Motivation, Confidence and Evaluation by Niemelä et al. [37]. Also Hirvonen et al. [39], in their factor analyses, ended up with three factors, which they labelled Awareness, Access and Assessment. The contents are, however, nearly identical to those of Niemelä et al. [37]. In contrast to these, Mayer [38], although using factor analysis, as well, found only two factors, which she called Motivation and Confidence, whereas the Evaluation/Assessment factor of the previous studies did not load as a separate factor on her German sample. As also Hirvonen et al. [39] found some differences in the factorial structure of the Namibian sample compared to three Finnish samples, this might indicate limitations in applying the EHIL scale on different populations or culturally diverse information environments [39].

Nymberg et al. [30] found that older adults who were more positive about benefits of eHealth services often had at least some experience of digital tools, whereas only little or no experience was related to aversions towards such services. In our study, we did not analyse the relationship between experience of digital health services and positive or negative attitudes. This could be a topic of future research.

The findings imply that EHIL is a useful measure of how older adults perceive their own ability to manage health-related information and how that is linked to attitudes on digital health service use. The positive relation of confidence and evaluation (assessing trustworthiness) and optimistic attitude underlines the need to facilitate older adults' comfortability with health information instead of only motivating them to use it. From this perspective, rationalistic arguments and informing might not be enough and more emphasis should be placed on a positive information experience rather than mere access and the 'technical' (cf. more holistic, lifeworld-wide) usefulness of information. Such measures could be to consider how the contextual relevance of information in the life situations of older adults could be increased, and make information more easily

actionable and available in contexts and situations where individuals make decisions relevant to their health.

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Appendix A

Everyday Health Information Literacy

a. Motivation
1. It is important to be informed about health issues.
2. I know where to seek health information.
3. I like to get health information from a variety of sources.

b. Confidence
1. It is difficult to find health information from the Internet (reverse coded).
2. Health related terminology and statements are often difficult to understand (reverse coded).
3. It is difficult to know who to believe in health issues (reverse coded).

c. Evaluation
1. It is easy to assess the reliability of health information in printed sources (magazines and books).
2. It is easy to assess the reliability of health information on the Internet..
3. It is easy to determine if health information is inaccurate.

Optimistic Subject Position
1. I think that new digital health records services have a lot of potential to improve healthcare in general.
2. I think that using digital health record services is a good idea because it can lead to improvement in my health and healthcare.
3. I think that digital health record services, including e-health services, have a lot of

potential to improve life in general.
4. I think that using digital health record services is a good idea because it gives me a possibility to control e.g. that I get proper care, the information is correct and correctly managed.

Pessimistic Subject Position
1. I prefer to communicate directly with healthcare professionals rather than to use an indirect digital service.
2. I have or would have difficulties to understand information provided in digital health record services.