

# Contemporary eHealth Literacy Research – An Overview with Focus on Germany

Anna-Lena Pohl<sup>1</sup>, Lena Griebel<sup>2</sup>, Roland Trill<sup>1</sup>

<sup>1</sup> Institute for eHealth and Management in Healthcare,  
Flensburg University of Applied Sciences, Germany

<sup>2</sup> Chair of Medical Informatics,  
Friedrich-Alexander University Erlangen-Nürnberg, Germany

**Abstract.** eHealth Literacy is a crucial topic in regarding the acceptance of consumers towards eHealth services. There are several measurement methods, nevertheless they all lack interactive aspects of trending technologies such as mobile health apps or self-tracking services. Furthermore none of them acknowledges cultural and social backgrounds. Although the topic is of great importance it seems to be underrepresented in Germany.

## 1 Introduction

In today's society electronic health services (eHealth) play an increasing role and generally in the western societies there is a great willingness to use them [1-3]. EHealth services are able to offer a variety of advantages to the user [4-6]. Eland-de Kok et al. found in a systematic review that eHealth interventions for chronically ill persons can lead to positive effects on primary health outcomes [7]. Santana and colleagues measured that almost 27% of European citizens who had searched for health information online also have made active suggestions on diagnosis or treatment to their physician and thus took a more active role in medical decision making [6]. In a meta-analysis of randomized controlled trials on the effects of consumer health information technologies for diabetes patients, Or and Tao found that the usage of eHealth technologies reveal positive effects on clinical parameters such as blood pressure or cholesterol levels [8].

Nevertheless the literature shows that eHealth services often are not accepted by the intended users (e.g. Google Health) [9] at all or that the interest is flagging over time [10]. If health services on the Internet are not used properly it might lead to emotional harm of the user or, in one reported case to the death of a patient [11]. Numerous factors contributing to an appropriate use of eHealth services include different facets: There might be different contexts of use (e.g. support from other persons) [12], different personalities (e.g. high intrinsic motivation, anxiety) [12, 13], and characteristics of the intended users (e.g. gender, age) [12] or diverse competencies of the users to use eHealth services [14, 15].

In addition, it is vital to know potential end-users' obstacles to use such services. Due to the technological development and the increasing importance of modern

*Copyright © 2016 by the paper's authors. Copying permitted for private and academic purposes.*

*In: G. Cumming, T. French, H. Gilstad, M.G. Jaatun, E.A.A. Jaatun (eds.):  
Proceedings of the 3<sup>rd</sup> European Workshop on Practical Aspects of Health Informatics  
(PAHI 2015), Elgin, Scotland, UK, 27-OCT-2015, published at <http://ceur-ws.org>*

information technology eHealth literacy research is the key part in health literacy research.

Due to ubiquitous accessible health information and interactive functions eHealth services are expected to help overcome unequal access to health care and thus help decrease social inequalities in health care. Nevertheless, we face the risk that individuals will not use them in the most efficient way simply because they are not able to. Thus, it is essential to understand what skills are needed to use eHealth services efficiently. Nevertheless, the contemporary understanding of eHealth literacy seems to lack several important aspects regarding further eHealth barriers such as other personality factors like anxiety or trust. Although in other nations like the United States or Scandinavian countries there is a vivid eHealth literacy research it appears that Germany is mostly lacking those research efforts. The objective of this article therefore is twofold: First it shows how the contemporary research regards eHealth Literacy and what aspects might be missing. A new approach is presented to integrate technology acceptance models into the eHealth literacy concept. Second it focuses especially on Germany and provides insights into German eHealth literacy research by presenting an overview on the research state and introducing several research projects.

## **2 Methods**

To work on the first focus of this paper – the contemporary eHealth literacy research and the promotion of a possible model extension – we conducted a literature research in MEDLINE searching for terms like “technology acceptance AND ehealth”, “eHealth” AND “literacy” AND factors OR “barriers”. Furthermore a workshop was conducted during the 2014 MIE in Madrid to discuss possible eHealth barriers with experts.

To answer the second question regarding the state of eHealth literacy research in Germany Internet researches were conducted; also article alerts from MEDLINE providing regular updates on articles with the topic of eHealth literacy were used.

## **3 Results**

### **3.1 eHealth Literacy research – state of the art and model extension**

Health Literacy is a term that was first introduced over 30 years ago [16]. Ratzan and Parker created the mostly used definition; according to them Health Literacy is “the degree to which individuals have the capacity to obtain, process, and understand basic health information and services needed to make appropriate health decisions” [17].

Since the 1970s the concept of Health Literacy has been used widely in research and can be measured by a large variety of tools (e.g. TOFHLA, HALS, REALM, MART, FHLM, ELF...) [18]. One problem with these tools is that although they offer

gold-standard for the measurement of Health Literacy (like TOFHLA and REALM), it is not possible to apply them for computer-based use [19].

Due to this background an extension of the Health Literacy concept to include e-health related competencies was performed. Cameron Norman and Harvey Skinner were pioneering in the concept of eHealth Literacy: They defined it as “the ability to seek, find, understand, appraise health information from electronic sources and apply the gained knowledge to addressing or solving a health problem” [20].

Whereas Health Literacy measures competencies in the context of paper-based resources in the healthcare environment, eHealth Literacy is much more complex: Persons who are intended to use electronic sources for health purposes need a variety of skills – basic literacy (reading and writing of texts) is as well necessary as knowing how to use computers and understand and evaluate science and media [20]. So Norman and Skinner defined eHealth Literacy not just as a combination out of the capability to use computers and Health Literacy but as a meta-literacy out of different facets of literacy.

Thus eHealth Literacy consists of six domain-specific facets:

- Health literacy: Health knowledge comprehension
- Computer literacy: Skills to use hard- and software to solve problems
- Science literacy: Understanding science processes and outcomes

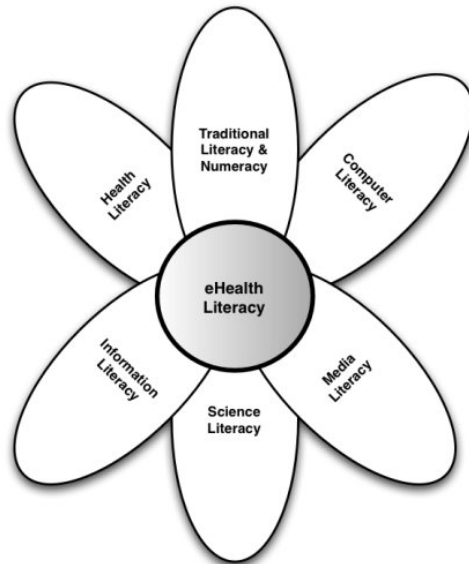
These three competencies are the context-specific components of the e-health literacy model as they describe abilities needed to use electronic sources for health purposes. As one can see, health literacy is a part of it. Those components are supplemented by three analytic components describing more general competencies. Here constructs like traditional literacy are included:

- Traditional literacy: Reading, writing, and numeracy, which is important as electronic sources of health information are still text dominant.
- Media literacy: Thinking critically about media content
- Information literacy: Seeking and understanding information to make decisions

eHealth Literacy takes up the idea of health literacy but makes an addition to it by including more competencies. All the competencies are grouped in the so-called Lily model which is shown in Fig. 1. Important for the understanding of eHealth Literacy is as well that the competencies are not stable but might increase over the time [20] thus enabling the training of said literacy [21].

The aim of measuring eHealth Literacy is to prevent the creation of tools to promote health and deliver health care service that are inaccessible to the users they are intended for. By measuring an individual’s eHealth Literacy it is possible to get an overview of his or her competencies. Furthermore the functionality of e-health application software can be evaluated by measuring the changing of competencies over the time this software is used.

Until now eHEALS (eHealth Literacy Scale), [22] is the widest used measurement tool for assessing e-health literacy of individuals [19], consisting of 8-10 items. Norman and Skinner developed it in English using a sample of Canadian adolescents [14, 22]. Koo et al., van der Vaart et al., and Mitsutake et al translated eHEALS into Chinese, Dutch, respectively Japanese [23-25]. Soellner et al. provided a German translation of the eHEALS [26].



**Fig. 1: eHealth Literacy: The Lily Model**

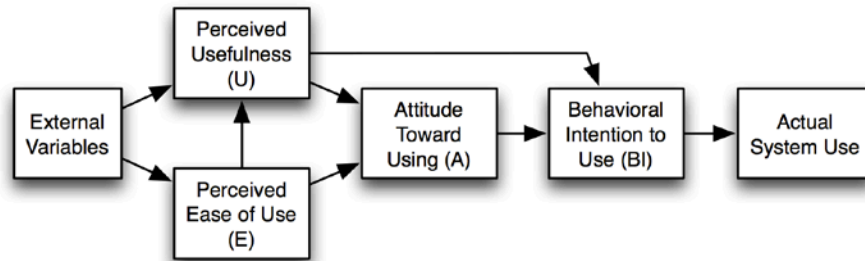
Cameron Norman who, together with Harvey Skinner, created the Lily Model in 2006 wrote five years later that he sees some problems with it, for example that it does not fit to the Web 2.0 solutions [27]. Others stated that eHealth literacy was heavily depending on social structures [24] or the individual motivation to use a system [13] which is not included in the original Lily Model. Thus the original Lily Model is lacking several aspects of eHealth usage such as the contexts of use, further user characteristics like anxiety or motivation, and different personalities of the intended users including age, gender and socioeconomic status.

In her article “Toward a Comprehensive Model of eHealth Literacy” for the PAHI workshop 2014 [28] Heidi Gilstad describes how she included other literacies like cultural, contextual, and communicative competencies into the Lily Model. Furthermore she emphasized that it was important to distinguish between propositional (knowledge generated from theoretical sources such as books or research articles) and procedural knowledge (gained from practical experiences).

This is a very interesting approach to enrich the Lily Model. In our research we regarded numerous models dealing with technology acceptance factors besides the eHealth literacy concept.

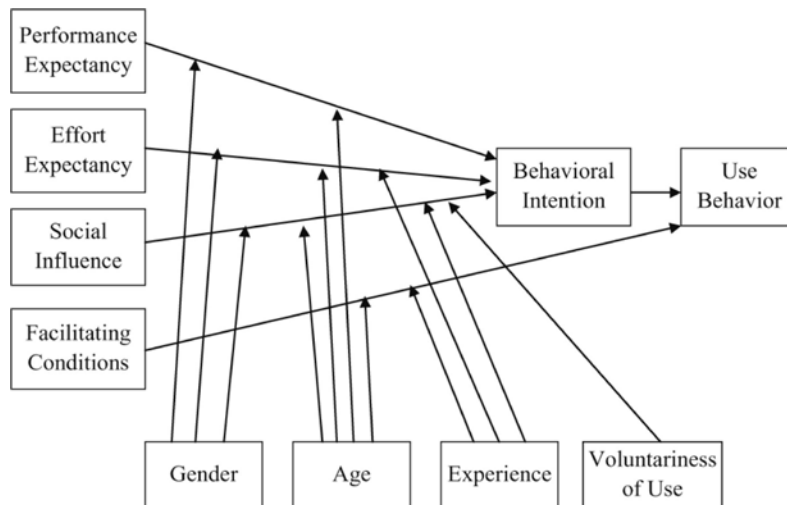
Well-known and widely used is the Technology Acceptance Model (TAM) which was developed in the 1980's in the light of the concern that workers were not using IT. Its originators reasoned that the key to increasing use was to first increase the acceptance towards IT, which could be assessed by asking individuals about their future intentions to use the IT. Knowing the factors that shaped one's intention would allow organizations to manipulate those factors in order to promote acceptance and thus increase IT use. Early TAM research discovered that only two factors (perceived

usefulness and perceived ease of use) were needed to explain, predict, and presumably control acceptance [29] (Fig. 2).



**Fig. 2: Technology Acceptance Model (TAM)**

Until today the original TAM model has gone through a number of changes (TAM2, TAM3, and UTAUT). An impressive effort to unify the IT acceptance resulted in the Unified Theory of Acceptance and Use of Technology (UTAUT), a [12] (Fig. 3).



**Fig. 3: Unified Theory of Acceptance and Use of Technology (UTAUT)**

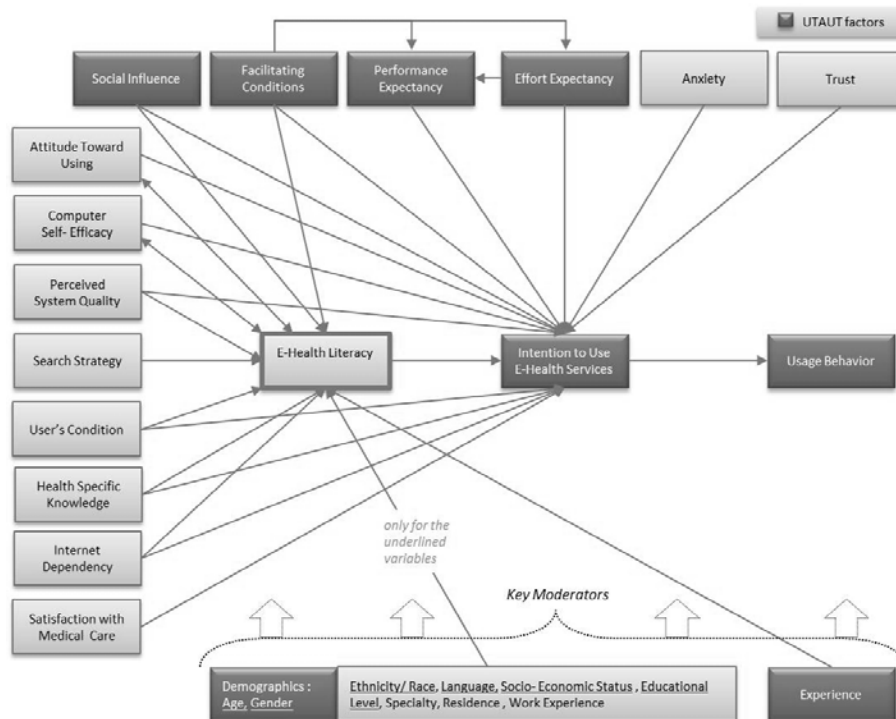
Nevertheless neither the eHealth Literacy model nor the technology acceptance models do include all relevant factors leading to the acceptance of eHealth services.

Regarding the research on eHealth usage among consumers it becomes clear that eHealth literacy is only one amongst other factors influencing the use behavior. During a workshop focusing on consumer-oriented eHealth barriers conducted at the Medical Informatics Europe (MIE) conference 2015 in Madrid, Spain with

interdisciplinary experts (e.g. medical professionals, technicians, and social scientists) this finding was supported: eHealth Literacy is one important but by far not the only factor that needs to be taken into account when regarding and predicting the usage behavior towards eHealth solutions among consumers. Literacy is merely one of several cognitive barriers amongst barriers regarding the motivation of the user, the accessibility to Internet technologies, trust issues, environmental and organizational barriers and technical barriers such as the usability of the respective service [30].

This finding is supported by a literature research conducted in 2013 using Medline. The review showed that eHealth service acceptance was influenced by many factors including e.g. trust, anxiety of the user, or UTAUT factors such as the perceived usefulness of a service. EHealth Literacy was found to be directly connected with the intention to use eHealth services [31]. In a subsequently developed research model eHealth Literacy was thus a central explanation factor of the intention to use eHealth services. The research model which aims to provide an overview on eHealth acceptance factors is shown in Fig. 4.

For example if a person intends to use an eHealth service his or her acceptance directly depends on factors like the social influence (do other persons who are important for me think that I should use the system?), facilitating conditions (are there conditions that help me using the system?), performance expectancy (what benefit do I expect by using the system?), and effort expectancy (what efforts do I expect by using the system?). Those factors were derived from the UTAUT model. Besides those factors anxiety and trust were found to directly influence the intention to use eHealth services by analyzing the literature [32, 33]. Direct influence was also found for the user's condition (the degree of well-being) [32, 34], the health specific knowledge (the users' perception of how much knowledge they have regarding the own health condition) [35, 36], the Internet dependency (degree of habit or compulsion to use the Internet for information or self-management) [20], and the satisfaction with medical care (users' beliefs concerning the medical services received or experienced) [32]. Attitude towards using describes the expected feeling about using an eHealth service and was as well found to have a direct influence on the usage intention [32] as the computer self-efficacy (individual judgement of the own capability to use computers or eHealth services) [37].



**Fig. 4: eHealth Literacy and Technology Acceptance - a research model**

### 3.2 eHealth Literacy Measurement – State of the Art

By measuring an individual's eHealth Literacy it is possible to get an overview of his or her competencies that are needed for using eHealth services and applications. Furthermore the functionality of e-health application software can be evaluated by measuring the changing of competencies over the time this software is used. Until now eHEALS (eHealth Literacy Scale), [22] is the widest used measurement tool for assessing e-health literacy of individuals [19], consisting of 8-10 items. Norman and Skinner developed it in English using a sample of Canadian adolescents [14, 22]. Koo et al., van der Vaart et al., and Mitsutake et al translated eHEALS into Chinese, Dutch, respectively Japanese [23-25]. Soellner et al. provided a German translation of the eHEALS [26].

After it has been developed by Norman and Skinner in 2006 the eHEALS has been used several times in the healthcare environment. Brown and Dickson measured healthcare student's e-health literacy skills [38].

Also Hove et al., Ghaddar et al., and Paek and Hove used eHEALS to measure eHealth Literacy of adolescents [39-41]. Neter et al. reduced the number of items to only six to measure eHealth Literacy in the average Israeli adult population [14]. Another broad approach of eHEALS to measure eHealth Literacy of a larger group of

people is the work of Mitsutake et al. who measured an association of approximately 3000 Japanese adults with their knowledge about colorectal cancer [42]. Furthermore Ossebaard et al. measured the eHealth related literacy for patients with chronic diseases. This study is one of the few found papers that used eHEALS outside of the North American area (Netherlands) [43]. Also eHealth Literacy of low-income parents with chronically ill children or with children that are in a pediatric palliative care program, HIV patients and older adults has been measured using eHEALS [44-48].

Tennant and Stelfson found that baby boomers and older persons who used Health 2.0 technologies had higher levels of eHealth Literacy than persons who did not. For their study they as well used the eHEALS [49].

An alternative measurement of eHealth literacy was proposed by Chan et al. who developed a taxonomy to characterize the complexity of several eHealth tasks and therefore draw conclusions on the individual users' competencies to perform those tasks [50]. This approach nevertheless is very complex and time consuming as it implies the direct observation of individual persons during their usage of an eHealth system. In our approach including three spatially separated user sites with a large number of users it was not practicable to perform such an observational study. In 2014, Chew published a conference paper dealing with the development of a new scale to measure eHealth literacy [51].

In 2013 Jones developed the Patient eHealth Readiness Scale (PERQ) which includes items from the eHEALS as well as contextual factors like Internet use, support from other persons and demographics such as age and gender [52]. This approach has been used two times in published papers [53, 54]. Philipp Abbott-Garner from Plymouth University currently uses it in his PhD work [55].

The work of Chew has not been tested in the practice yet thus does not deliver starting points for its usage. To adequately address the finding that the eHealth Literacy concept does not include all relevant factors explaining the use of interactive eHealth solutions a broader range of factors should be included in a measurement tool to adequately assess eHealth Literacy.

There has been done some international research in measuring eHealth Literacy but still all tools lack the acknowledgement of different personal backgrounds that influence deeply the measured competencies: social and cultural factors need to be taken into account when discussing the level of eHealth Literacy.

### **3.3 eHealth Literacy in Germany**

In Germany research on eHealth Literacy is practically still in its infancy. A group of researchers around Prof. Dr. Soellner at the University of Hildesheim translated the self-reported measurement tool eHeals in German [26]. It was presented for the first time at a conference in France in 2013.

The University of Bielefeld organized a Health Literacy conference in 2014 where eHealth Literacy as an independent field of research unfortunately was just a side note. Research on Health Literacy of children and adolescents is done by Ullrich



Bauer who is situated at the Faculty of Education at the University of Bielefeld. He concentrates on health literacy and has no focus on eHealth Literacy.

Apart from these approaches the authors of this paper are working on the subject of eHealth Literacy. At the chair of Medical Informatics at the University of Erlangen-Nürnberg a project developed the eHealth Monitor. It provides a platform that generates a Personal eHealth Knowledge Space (PeKS) as an aggregation of several knowledge sources (e.g., ECG reports or information pages from the Internet) relevant for the provision of individualized personal eHealth services. This is realised by integrating service-oriented architecture, knowledge engineering, multiagent systems, and wearable/portable devices technologies.

The eHealthMonitor was evaluated in the light of acceptance factors including eHealth Literacy measurement of medical laypersons and medical professionals in three study sites (Germany, Poland, and Greece) using the eHEALS. It was found that the self-assessed eHealth Literacy of all user groups was medium to high whereas the biggest barriers towards the use of eHealthMonitor have been seen in data privacy aspects and usability issues [56].

At the Institute for eHealth and Management in Healthcare (IEMG) at Flensburg University of Applied Sciences two project applications dealing with eHealth Literacy of specific user groups are currently prepared. The research field is also part of the research done in the eHealth for Regions Network, which is coordinated at the IEMG in Flensburg.

Another German initiative in the field of eHealth Literacy is the national ePatient survey [23]. The users of online eHealth information websites are questioned concerning their user habits and the effects on their health and medical therapies and on their health behavior. The survey is conducted online and carried out annually since 2010. The outcomes are used to analyse the user habits of patients, their families and other groups depending on their diseases, risk factors, therapies and care pathways. It monitors the behaviour of individuals seeking for health information in the internet in the German speaking area. The survey asks the users about their usage habits and the effects of the web usage on their health behaviour, diseases and therapy. Studies have shown that the usage of internet for seeking health information has a significant impact on knowledge, attitude and health behaviour and internet based health and care services can help to optimize medical therapy. Until now the survey has not yet been scientifically evaluated. According to the findings some hypothesis can be formulated regarding future research on eHealth literacy, acceptance of eHealth services and patient empowerment.

## 4 Conclusion

To conclude, one can say that internationally there is a vivid research on eHealth Literacy and there are possibilities to measure it. Nevertheless there are four points that are open for future research:

1. How is eHealth Literacy connected with other acceptance factors? How important is it that consumers have a high eHealth Literacy from the beginning when it is possible that their competencies increase over time?

2. How can eHealth Literacy be measured and interpreted taken into account social and cultural backgrounds of people?
3. Does the eHealth Literacy construct needs a rebuilding in the light of trending interactive health technology solutions such as mobile health? There are services that use the Internet without the user having to handle browser etc. (e.g. smart watches).
4. What are the reasons that eHealth Literacy research is still so weak in Germany and how can it be fostered?

In the future research to answer all those questions is needed. Besides all possible further acceptance barriers that might be at least as important as eHealth Literacy, the ability to use eHealth services properly will always be a key to the success of all kind of electronic health services.

Due to this it is essential that Germany starts to take the user into account and focuses on his wishes and expectations. For this a large study is needed providing an overview on German laypersons competencies concerning eHealth services including mobile Health services and interactive health solutions.

## References

1. Andreassen, H., Bujnowska-Fedak, M., Chronaki, C., Dumitru, R., Pudule, I., Santana, S., Voss, H., Wynn, R.: European citizens' use of E-health services: A study of seven countries. *BMC Public Health* 7, (2007)
2. [http://www.fiercemobilehealthcare.com/story/physicians-split-use-mhealth-apps/2014-02-24?utm\\_medium=nl&utm\\_source=internal](http://www.fiercemobilehealthcare.com/story/physicians-split-use-mhealth-apps/2014-02-24?utm_medium=nl&utm_source=internal).
3. <http://www.pewinternet.org/2013/01/15/health-online-2013/>
4. Eysenbach, G.: What is e-health? *Journal of medical Internet research* 3, e20 (2001)
5. Holmström, I., Röing, M.: The relation between patient-centeredness and patient empowerment: A discussion on concepts. *Patient education and counseling* 79, 167-172 (2010)
6. Santana, S., Lausen, B., Bujnowska-Fedak, M., Chronaki, C., Prokosch, H., Wynn, R.: Informed citizen and empowered citizen in health: results from an European survey. *BMC Family Practice* 12, (2011)
7. Eland-de Kok, P., van Os-Medendorp, H., Vergouwe-Meijer, A., Bruijnzeel-Koomen, C., Ros, W.: A systematic review of the effects of e-health on chronically ill patients. *Journal of clinical nursing* 20, 2997-3010 (2011)
8. Or, C.K., Tao, D.: Does the use of consumer health information technology improve outcomes in the patient self-management of diabetes? A meta-analysis and narrative review of randomized controlled trials. *International journal of medical informatics* 83, 320-329 (2014)
9. <http://ddormer.wordpress.com/2011/06/29/lessons-from-google-health/>  
<http://www.himss.org/News/NewsDetail.aspx?ItemNumber=4425>
10. Kelders, M.S., Van Gemert-Pijnen, E.W.C.J., Werkman, A., Nijland, N., Seydel, R.E.: Effectiveness of a Web-based Intervention Aimed at Healthy

- Dietary and Physical Activity Behavior: A Randomized Controlled Trial About Users and Usage. *Journal of medical Internet research* 13, e32 (2011)
11. Crocco, A.G., Villasis-Keever, M., Jadad, A.R.: Analysis of cases of harm associated with use of health information on the internet. *Jama* 287, 2869-2871 (2002)
  12. Venkatesh, V., Morris, M.G., Gordon, B.D., Davis, F.D.: User Acceptance of Information Technology: Toward a Unified View. *MIS Quarterly* 27, 425-478 (2003)
  13. Bodie, G.D., Dutta, M.J.: Understanding health literacy for strategic health marketing: eHealth literacy, health disparities, and the digital divide. *Health marketing quarterly* 25, 175-203 (2008)
  14. Neter, E., Brainin, E.: eHealth literacy: extending the digital divide to the realm of health information. *Journal of medical Internet research* 14, e19 (2012)
  15. van Dijk, J.A.G.M.: *The Deepening Divide: Inequality in the Information Society*. SAGE Publications (2005)
  16. Simonds, S.K.: Health education as social policy. . *Health Education Monograph* 2, 1-25 (1974)
  17. Ratzan, S.C., Parker, R.: Introduction. In: Seldon, C., Zorn, M., Ratzan, S.C., Parker, R. (eds.) *National Library of Medicine current Bibliographies in Medicine: Health Literacy*. National Institutes of Health, US Department of Health and Human Services, Washington, DC (2000)
  18. <http://www.nchealthliteracy.org/instruments.html>
  19. Collins, S.A., Currie, L.M., Bakken, S., Vawdrey, D.K., Stone, P.W.: Health literacy screening instruments for eHealth applications: A systematic review. *J. Biomed. Inform.* 45, 598-607 (2012)
  20. Norman, C.D., Skinner, H.A.: eHealth Literacy: Essential Skills for Consumer Health in a Networked World. *Journal of medical Internet research* 8, e9 (2006)
  21. Xie, B.: Improving older adults' e-health literacy through computer training using NIH online resources. *Library & information science research* 34, 63-71 (2012)
  22. Norman, C.D., Skinner, H.A.: eHEALS: The eHealth Literacy Scale. *Journal of medical Internet research* 8, e27 (2006)
  23. Koo, M., Norman, C.D., Chang, H.-M.: Psychometric Evaluation of a Chinese Version of the eHealth Literacy Scale (eHEALS) in School Age Children. *International Electronic Journal of Health Education* 15, 29-36 (2012)
  24. van der Vaart, R., van Deursen, A.J., Drossaert, C.H., Taal, E., van Dijk, J.A., van de Laar, M.A.: Does the eHealth Literacy Scale (eHEALS) measure what it intends to measure? Validation of a Dutch version of the eHEALS in two adult populations. *Journal of medical Internet research* 13, e86 (2011)
  25. Mitsutake, S., Shibata, A., Ishii, K., Okazaki, K., Oka, K.: [Developing Japanese version of the eHealth Literacy Scale (eHEALS)]. [Nihon koshu eisei zasshi] *Japanese journal of public health* 58, 361-371 (2011)
  26. Soellner, R., Huber, S., Reder, M.: The concept of eHealth literacy and its measurement: German translation of the eHEALS. *Journal of Media Psychology* 26, 29-38 (2014)

27. Norman, C.: eHealth literacy 2.0: problems and opportunities with an evolving concept. *Journal of medical Internet research* 13, e125 (2011)
28. Gilstad, H.: Toward a Comprehensive Model of eHealth Literacy. In: 2nd European Workshop on Practical Aspects of Health Informatics, pp. 63-72. (Year)
29. Davis, F.D., Bagozzi, R.P., Warshaw, P.R.: User Acceptance Of Computer Technology: A Comparison Of Two Theoretical Models. *Management Science* 35, 982-1003 (1989)
30. Griebel, L., Pobiruchin, M., Wiesner, M.: Consumer Health Informatics: Barriers and Facilitators of eHealth Usage among Consumers. In: 26th European Medical Informatics Conference (MIE 2015). (Year)
31. Noblin, A., Wan, T., Fottler, M.: The Impact of Health Literacy on a Patient's Decision to Adopt a Personal Health Record. *Perspectives in Health Information Management* Fall, (2012)
32. Hardiker, N., Grant, M.: Factors that influence public engagement with eHealth: A literature review. *Int J Med Inf* 80, 1-12 (2011)
33. Or, C.K.L., Karsh, B.-T.: A Systematic Review of Patient Acceptance of Consumer Health Information Technology. *J Am Med Inform Assoc* 16, 550-560 (2009)
34. Cashen, M., Dykes, P., Gerber, B.: eHealth technology and Internet resources: barriers for vulnerable populations. *The Journal of cardiovascular nursing* 19, 209-214 (2004)
35. Or, C.K.L., Karsh, B.-T., Severtson, D.J., Burke, L.J., Brown, R.L., Brennan, P.F.: Factors affecting home care patients' acceptance of a web-based interactive self-management technology. *Journal of the American Medical Informatics Association* 18, 51-59 (2011)
36. Wilson, E.V., Lankton, N.K.: Modeling Patients' Acceptance of Provider-delivered E-health. *Journal of the American Medical Informatics Association* 11, 241-248 (2004)
37. Wu, J.H., Wang, S.C., Lin, L.M.: Mobile computing acceptance factors in the healthcare industry: a structural equation model. *International journal of medical informatics* 76, 66-77 (2007)
38. Brown, C.A., Dickson, R.: Healthcare students' e-literacy skills. *Journal of allied health* 39, 179-184 (2010)
39. Hove, T., Paek, H.-J., Isaacson, T.: Using adolescent eHealth literacy to weight trust in commercial web sites: The more children know, the tougher they are to persuade. *Journal of Advertising Research* 51, 524-537 (2011)
40. Ghaddar, S.F., Valerio, M.A., Garcia, C.M., Hansen, L.: Adolescent health literacy: the importance of credible sources for online health information. *The Journal of school health* 82, 28-36 (2012)
41. Paek, H.J., Hove, T.: Social Cognitive Factors and Perceived Social Influences That Improve Adolescent eHealth Literacy. *Health communication* (2012)
42. Mitsutake, S., Shibata, A., Ishii, K., Oka, K.: Association of eHealth Literacy With Colorectal Cancer Knowledge and Screening Practice Among Internet Users in Japan. *Journal of medical Internet research* 14, e153 (2012)

43. Ossebaard, H.C., Seydel, E.R., van Gemert-Pijnen, L.: Online usability and patients with long-term conditions: a mixed-methods approach. *International journal of medical informatics* 81, 374-387 (2012)
44. Robinson, C., Graham, J.: Perceived Internet health literacy of HIV-positive people through the provision of a computer and Internet health education intervention. *Health information and libraries journal* 27, 295-303 (2010)
45. Knapp, C., Madden, V., Wang, H., Sloyer, P., Shenkman, E.: Internet use and eHealth literacy of low-income parents whose children have special health care needs. *Journal of medical Internet research* 13, e75 (2011)
46. Xie, B.: Effects of an eHealth literacy intervention for older adults. *Journal of medical Internet research* 13, e90 (2011)
47. Xie, B.: Experimenting on the Impact of Learning Methods and Information Presentation Channels on Older Adults' e-Health Literacy. *J. Am. Soc. Inf. Sci. Technol.* 62, 1797-1807 (2011)
48. Knapp, C., Madden, V., Marcu, M., Wang, H., Curtis, C., Sloyer, P., Shenkman, E.: Information seeking behaviors of parents whose children have life-threatening illnesses. *Pediatric blood & cancer* 56, 805-811 (2011)
49. Tennant, B., Stellefson, M.: eHealth Literacy and Web 2.0 Health Information Seeking Behaviors Among Baby Boomers and Older Adults. *Journal of medical Internet research* 17, e70 (2015)
50. Chan, C.V., Kaufman, D.R.: A framework for characterizing eHealth literacy demands and barriers. *Journal of medical Internet research* 13, e94 (2011)
51. Chew, F.: Developing a New Scale to Measure E-Health Literacy. *Medicine 2.0 World Congress on Social Media, Mobile Apps, Internet / Web 2.0*, (2014)
52. Jones, R.: Development of a Questionnaire and Cross-Sectional Survey of Patient eHealth Readiness and eHealth Inequalities. *Medicine 2.0* 2, e9 (2013)
53. Jones, R.B., Ashurst, E.J., Atkey, J., Duffy, B.: Older People Going Online: Its Value and Before-After Evaluation of Volunteer Support. *Journal of medical Internet research* 17, e122 (2015)
54. LeRouge, C., Van Slyke, C., Seale, D., Wright, K.: Baby Boomers' Adoption of Consumer Health Technologies: Survey on Readiness and Barriers. *Journal of medical Internet research* 16, e200 (2014)
55. Abbott-Garner, P.: Do superfast broadband and tailored interventions improve use of e-health and reduce health related travel?
56. Griebel, L., Kolominsky-Rabas, P., Schaller, S., Siudyka, J., Sierpinski, R., Papapavlou, D., Simeonidou, A., Prokosch, H.U., Sedlmayr, M.: Acceptance of medical laypersons and medical professionals towards the personalized eHealth platform eHealthMonitor. University of Erlangen-Nürnberg (2015)

