

Health literacy: a marker for “digital divide” in health information

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Introduction

eHealth refers to «the use of emerging information and communications technology to improve or enable health and health care» [1]. eHealth literacy, which includes the component of **health literacy** [2-4], effectively links health consumers to the outcomes typical of Internet use – that is, opportunities, possible harm [5], and inequalities (e.g., being part of a minority or disenfranchised group [6-8], education [9-12], age [12-14], and gender [14-16]). In the 1990s, the concern over inequalities related to the digital divide focused mainly on infrastructural access: ownership, availability, and affordability of the infrastructure [17]. The discourse on the digital divide has expanded to other concerns, shifting the emphases to patterns of access [18], usage [19,20], and online skills rather than mere access to technology [12,19,20]. eHealth literacy may constitute a second divide in the health domain [20,21]. Norman and Skinner [22] propose that eHealth literacy is «the ability to seek, find, understand and appraise health information from electronic sources and apply knowledge gained to addressing or solving a health problem». They propose that eHealth literacy encompasses 6 kinds of literacies: **traditional** (literacy and numeracy), **information, media, health, computer, and scientific**, and they developed an eHealth literacy scale (eHEALS) [23]. Norman and Skinner emphasized that eHealth literacy should be viewed as a process that evolves over time rather than a static attribute. Viewed as malleable, eHealth literacy may indeed «empower individuals and enable them to fully participate in health decisions informed by eHealth resources» [22]. Conversely, the extension of digital resources to the health domain can also create new gaps between health consumers [13,24]. eHealth literacy hinges not on the digital divide in terms of access but rather on the knowledge gap [25], thus lending support to the hypothesis that information technology is creating a new social inequality, rather than leveling out social discrepancies [24-27].

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Present study and hypotheses

Following the literature on the digital divide and the digital divide index (DIDIX) in an Israeli sample [14], we hypothesized that people with higher eHealth literacy would be younger and of higher socio-economic status, would have more access to digital resources, and would exhibit a higher degree of digital literacy than those with lower eHealth literacy.

In the domain of information consumption we hypothesized that people with high eHealth literacy, compared with people low in eHealth literacy, would:

- use more sources of information (magazines, books, television and radio, and interpersonal resources);
- use a variety of search strategies in addition to “googling”;
- judge the information on the Internet more critically and would use more criteria for evaluating health information, and
- experience more outcomes and in a higher valence as a consequence of using the Internet.

We did not hypothesize about a relationship between eHealth literacy with gender and health status due to shifting findings on gender [14-16,28-30] and conflicting findings on health status [31-34].

Methods

Data Collection and Sample Characteristics

Data were collected from a nationally representative random-digital-dial telephone household survey of the Israeli adult population (18 years of age and older). Calls were placed to 4286 residential households to identify 2201 eligible potential respondents who use the Internet. Of these respondents, 1289 used the Internet for health purposes. The interviews were conducted by professional interviewers who used computer-assisted telephone interviewing software.

Measurements

eHealth literacy (perceived) was examined using Norman and Skinner’s [23] scale (alpha = 0.86).

Internet access was measured by asking participants whether they used the Internet in any of 5 locations at least once a month (library/community center, friend’s, neighbor’s, Internet cafe, or school/university).

Digital literacy was tapped by asking for the frequency of engaging in 6 activities: visiting blogs, participating in discussion forums, playing games, downloading or listening to music, downloading software, or emailing with friends (alpha = 0.75).

Health information **sources** were examined by asking “How often do you get health information from the following sources?”. The list (alpha = 0.64) included Internet, radio, television, newspapers/magazines, books, pharmacist, nurse, physician, family members, and friends.

Health information **content** on the Internet was examined by asking «How often do you search the Internet for information related to the following domains and actions?». A list (alpha = 0.80) included seeking information about physicians; institutions that provide health services (hospitals, community clinics, pharmacies, etc); potential treatments (procedures and drugs); and social support.

Search strategies employed to obtain digital health information were examined by asking «In order to find health information on the Internet you usually do the following...». A list of 5 common search actions (alpha = 0.64) was presented: use a site that my physician recommended; follow links that appear on websites; ask questions in forums; use my Favorites list; and use a site that a friend recommended.

Evaluation criteria were examined using Barnes and colleagues’ scale [35] (alpha = 0.77).

Perceived outcomes of seeking health information on the Internet were examined by using a list of 9 outcomes, adapted from Baker et al. [36] ($\alpha = 0.87$).

Socio-demographic information included sex, age, levels of obtained education, perceived religiosity, perceived health condition, and chronic diseases.

Results

Socio-demographic and digital characteristics of the eHealth literacy groups

The high and low eHealth literacy groups did not differ in gender, but the high eHealth literacy group was significantly younger and held a higher socioeconomic status (as measured by education) than the low eHealth literacy group.

The health status of the eHealth groups was significantly different between the eHealth literacy groups: a quarter of the lower eHealth literacy group reported having a chronic illness, as compared with only 18.8% respondents of the higher eHealth literacy group. There was no significant difference between the high and low eHealth literacy groups in perceived health.

eHealth literacy emerged as related to digital access and literacy. Respondents in the high eHealth literacy group had significantly more access to computers, used the Internet more frequently and reported higher digital literacy than did the low eHealth literacy.

Information consumption: health information sources, health information content on the Internet, health website evaluation criteria

eHealth literacy is a marker for consuming more information. Overall, respondents in the high eHealth literacy group used significantly more information sources than did the low eHealth literacy group: they used significantly more written material such as books, newspapers, magazines, and the Internet, but there is no statistically significant difference between the two eHealth literacy groups in their use of live information from radio and television, a pharmacist, a nurse, or a physician.

Respondents in the high eHealth literacy group searched for significantly more content on the Internet than did the low eHealth literacy group, irrespective of the type of health content: social (e.g., social

Variable	Low		High		F	P value
	Mean	SD	Mean	SD		
Outcomes (index)	2.76	0.88	3.40	0.83	177.76	< 0.001
• Understanding of symptoms, conditions, treatment	3.30	1.20	3.95	0.96	115.56	< 0.001
• Update in health innovations	3.01	1.24	3.71	1.16	108.04	< 0.001
• Self-managing health	2.37	1.24	3.13	1.34	87.39	< 0.001
• Affected health behaviors	2.75	1.25	3.41	1.25	87.39	< 0.001
• Use of insurance	2.23	1.33	2.77	1.43	45.95	< 0.001
• Asking physician questions	3.17	1.28	3.73	1.18	63.51	< 0.001
• Consulting physician on information retrieved	2.90	1.32	3.54	1.24	81.85	< 0.001
• Power position with physician	2.55	1.32	3.22	1.31	83.06	< 0.001

Table I. Scores for low and high eHealth literacy groups in outcomes of information search

support groups), service-related (e.g., availability of services, or information on physicians, hospitals, and pharmacies), and therapy-related content (e.g., health status, procedures, and medication).

The use of the Internet was different in terms of the search strategies employed by each of the two eHealth literacy groups: those high in eHealth literacy used every strategy significantly more often than those low in eHealth literacy (following links, asking questions on Internet forums, following recommendations of their friends and physicians, and using their Favorites list). In addition, the use of the Internet by participants who scored high on the eHealth literacy scale was marked by significantly more scrutiny, caution, and evaluation of the information they found.

Outcomes of information search

Finally, those highly eHealth literate gained significantly more from their information search than did the low eHealth literacy. The results are displayed in Table I.

Cognitively, people in the high eHealth literacy group reported gaining a better understanding of their health status, symptoms, and optional treatments (see items in Table I). They also benefited more instrumentally: the information search improved their ability to self-manage their health care needs, affected their health behaviors, and allowed them a better use of their health insurance. The benefits extended also to their interaction with the treating physician: they asked the physician significantly more questions than they would have without the digital information search, presented the physician with the information they retrieved, and felt significantly better positioned *vis-à-vis* the physician than did the low eHealth literacy group.

Discussion

The main contributions of this study lie in demonstrating that eHealth literacy skills extended the digital divide into the health domain. Indeed, for those who can realize the potential and possibilities, the Internet is a means of sustaining health, whether by providing information, linking to peers and professionals, or supporting self-management of health and illness [37]. However, the use of the Internet in the health domain is related to social inequality [38]: health information was already identified as capital-enhancing activity (vs. recreational activity) [16,39]. As theoreticians surmised [39-44], crossing the initial connectivity divide left numerous differences between people in how they incorporated the Internet into their lives. The implication of our findings is that low eHealth-literate people would be limited in their use of the resources available on the Internet.

Our findings are more in line with the strong hypothesis than with the weak hypothesis of the digital divide. The strong hypothesis posits that «the emergence of the information society will create new social cleavages and strengthen old ones» [25], whereas the weak hypothesis claims that the new technology will level out old differences, admittedly after witnessing a temporary gap during the dissemination of the new technology. Still, it is possible that the weak hypothesis is not altogether amiss. We may be in the midst of a change, as exemplified in gender, which was in the past related to digital access and literacy and turned out to be unrelated to eHealth literacy in this study.

The need to both educate at-risk and needy groups [45-47] (e.g., chronically ill) and design technology in a mode befitting more consumers emerges. Addressing those needs may not diminish the digital divide altogether, but it may ameliorate its consequences by bringing more people into the “have” group.

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