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Modeling the Online Health Information Seeking Process: Information Channel Selection Among University Students

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This study investigates the influence of individual and information characteristics on university students' information channel selection (that is, search engines, social question & answer sites, online health websites, and social networking sites) of online health information (OHI) for three different types of search tasks (factual, exploratory, and personal experience). Quantitative data were collected via an online questionnaire distributed to students on various postgraduate programs at a large UK university. In total, 291 responses were processed for descriptive statistics, Principal Component Analysis, and Poisson regression. Search engines are the most frequently used among the four channels of information discussed in this study. Credibility, ease of use, style, usefulness, and recommendation are the key factors influencing users' judgments of information characteristics (explaining over 62% of the variance). Poisson regression indicated that individuals' channel experience, age, student status, health status, and triangulation (comparing sources) as well as style, credibility, usefulness, and recommendation are substantive predictors for channel selection of OHI.

Introduction

Health information (HI) seeking behavior refers to a series of approaches and actions with which people inquire about health-related topics to assess potential complaints (Lambert & Loisel, 2007) and develop health-protective behaviors (Mills & Todorova, 2016) with the aim to reduce “the uncertainty regarding [their] health status” (Tardy & Hale, 1998, p. 338). HI seeking promotes health-related decision-making, timeliness of treatment, and the relief of anxiety and worries (Lambert & Loisel, 2007). The Internet is widely used for various health-related purposes, including advice, information seeking, and experience sharing (De Choudhury, Morris, & White, 2014). Currently, online resources occupy an increasingly significant position in the HI supply chain (Tu & Cohen, 2008; Zhang, Sun, & Kim, 2017), with a growing body of online health information (OHI) seekers and the proliferation of multiple information distribution channels. In fact, users utilize a variety of online means for their health queries, such as search engines, online health websites (OHWs), social networking sites (SNSs), and social question and answer (Q&A) sites (Fox & Duggan, 2013). A research conducted by the Pew Research Center in 2012 showed that 80% of online health inquiries start from search engines such as Google, Bing, or Yahoo (Fox & Duggan, 2013), which gather information from multiple resources and are found convenient and useful by users (De Choudhury et al., 2014). Social Q&A sites (for example, “Yahoo! Answers”) allow individuals to pose questions to a bulletin board viewed by a large community of users and such an approach can be seen as a proxy for healthcare professionals' advice (Bowler, Oh, & He, 2015). In the last few years, the way in which people seek HI has been

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changing due to the proliferation of social networking sites. Over 90% of all hospitals in the United States use at least one social media channel (Griffis et al., 2014) and 80% of SNSs users utilize social platforms to search HI (Fox, 2011a). According to Griffiths et al. (2012) and Zhang et al. (2017), SNSs such as Facebook and Twitter, which are based on real social ties, are more likely to be used for sharing minor symptoms and conditions. On the other hand, OHWs such as NHS Choices are more popular among users with chronic and stigmatized health conditions because of their anonymous nature (Newman, Lauterbach, Munson, Resnick, & Morris, 2011).

Digital HI channels can help people shape health awareness and gain a deeper understanding of specific medical conditions. Such channels are playing an increasingly important role in people's lives as society attributes more and more relevance to healthy lifestyles (Seçkin, 2010). However, the content of these channels varies in terms of their "nature (e.g., evidence-based *vs* experience-based), diversity and quantity" (Zhang et al., 2017, p. 303), as well as their quality (Eysenbach, Powell, Kuss, & Sa, 2002). The ability to critically evaluate the quality of these OHI channels is a fundamental determinant of health outcomes (Berkman, Sheridan, Donahue, Halpern, & Crotty, 2011) and is highly dependent on users' health literacy (Diviani, van den Putte, Giani, & van Weert, 2015), defined as an "individual skills to obtain, process and understand health information and services necessary to make appropriate health decisions" (Sørensen et al., 2012, p. 3).

It is hence important to understand how different users select OHI channels in different situations, as not much literature has been published on these complex relationships. This research aims to understand the processes that lead young adults, specifically university students, to select OHI. The authors plan to expand this aim to include other age groups in future studies. In particular, the research objectives are:

1. To identify the main differences in information channel selection due to individual and information characteristics.
2. To evaluate how search tasks of a different nature can influence users' information channel selection.

Literature Review

Online Health Information

It is no longer news that information seeking has shifted from traditional means such as printed media or direct communications with "experts" to a digital format (Brossard, 2013). Specifically, OHI seeking has become increasingly important as it offers, unlike the traditional physician-patient relationship, instant answers and access to a huge range of resources created and shared by both experts and lay people (Powell, Inglis, Ronnie, & Large, 2011; Quinn, Bond, & Nugent, 2017). The anonymous nature of OHI also enables users to inquire about uncomfortable and sensitive issues in complete privacy (Cotten & Gupta, 2004; Powell et al., 2011) and balances

the power struggle between patients and healthcare professionals (Cotten & Gupta, 2004; Jacobs, Amuta, & Jeon, 2017; Tan & Goonawardene, 2017).

However, OHI also poses concerns, as HI seekers are often worried about Internet tracking revealing health-related search histories to insurance companies or employers (Zhang et al., 2018), and many authors have argued that the credibility and reliability of OHI are still a widespread matter of concern (for example, Powell et al., 2011; Rowley, Johnson, & Sbaffi, 2015). Also, making health decisions based on information of uncertain quality can lead to damaging consequences, such as hindered treatment (Cline & Haynes, 2001) and severe health anxiety (Zhang, 2013).

Zhang (2012) separated the process of OHI seeking into four main components, namely, establishing an information need, identifying and accessing information sources, examining and evaluating information, and interpreting (using) information. Information need refers to the fact that information seekers could be motivated by a specific health problem (Zhang, 2012) which, in turn, would result in three distinct search purposes: factual (for seeking well-defined information), exploratory (for queries without definite answers), and personal experience (for searches based on prior personal experiences; Zhang et al., 2017). Identifying sources of HI is the step taking place after users realize the presence of an information need and intend to fill a knowledge gap (Fiksdal et al., 2014). The third step is judging and evaluating the HI, which represents the process of assessing the relevance of the information itself (Beaunoyer, Arsenaault, Lomanowska, & Guillon, 2017). The final step involves the actual use of the HI to fulfill the initial information need (Manganello et al., 2017). Therefore, it is important to contextualize the information-seeking process, depending on the channels used to gather HI to assess whether this aspect could also influence the information-seeking process.

University Students and OHI Seeking Behavior

Recent research conducted on university students has demonstrated how, even just throughout a single course of study, assessments of OHI change due to experience and to the development of critical appraisal skills with time (for example, Chen, Li, Liang, & Tsai, 2018; Johnson, Rowley, & Sbaffi, 2015; Rowley et al., 2015). In addition, students' information-seeking habits tend to differ from those of more mature people, as younger adults favor design features of the information (in particular, how easy the information is to access) rather than the actual content to make trustworthiness judgments (Rowley, Johnson, & Sbaffi, 2017). The ever-changing panorama of social media and interactive digital channels has shifted the way in which young people relate to OHI, making it a very dynamic area of research (Mou, Shin, & Cohen, 2017). In light of the fluid nature of this specific age group, a lot of studies have taken into consideration individual demographic characteristics, such as age (Djamasbi & Wilson, 2015), education (Rowley et al., 2015), gender (Rowley et al., 2017), and so on, but none, to the authors'

knowledge, has looked at students' OHI seeking behavior within specific search task and information channel selection boundaries.

Channels of OHI

Search engines refer to software systems designed to collect information on the web from multiple sources using regularly updated mathematical algorithms. Users' information needs are immediately met with search engines (De Choudhury et al., 2014), while also providing them with anonymity and privacy (Dobransky & Hargittai, 2012). A study by Fox (2011b) showed that 66% of Internet users browse search engines for HI regarding a specific disease or medical problem and 56% utilize search engines to seek information on a certain medical treatment or procedure. Internet users often show clear preferences toward search engines for seeking serious health conditions (for example, cancer and diabetes), disabilities (for example, autism), and highly stigmatized diseases (for example, HIV; De Choudhury et al., 2014; Zhang et al., 2017). HI searches can also be improved and personalized by search engines; in fact, for example, Bing UK cooperated with NHS Choices to improve search results and enhance efficiency for general practitioner and hospital queries (Gesenhues, 2017).

Social Q&A sites are designed for people to ask, answer, and rate topic-specific questions (Gazan, 2011). There are three main types of online social Q&A sites, "digital reference services," "ask an expert," and "social question and answer" sites (Bowler et al., 2015). "Digital reference services" are online tools for library patrons to pose reference questions to librarians (Bowler et al., 2015). "Ask an expert" sites offer answers provided by professionals from specific fields (Anesa & Fage-Butler, 2015). "Social question and answer" sites are participatory platforms where users can propose and answer questions to facilitate knowledge exchange. Through easy access to a wide user community and the content openness of social Q&A sites, information seekers can quickly assess their health conditions based on professionals' answers or on the advice of those with similar symptoms/diseases (Adamic, Zhang, Bakshy, & Ackerman, 2008). In particular, according to Bowler et al. (2015), young people are unwilling to ask their parents or a health expert about sensitive issues and use social Q&A sites as suitable alternatives. However, this same "openness" trait may also hinder users from posing private or serious health questions on such sites (Kim, Oh, & Oh, 2009).

OHWs are platforms that offer patients, as well as GPs and nurses, easy-to-access HI usually certified by independent, non-profit organizations (for example, Health on the Net Foundation, URAC, and so on). The use of OHWs has proven to reduce the demand for primary care consultations among younger, healthier people, who usually require fewer health services (Murray, Majeed, Khan, Lee, & Nelson, 2011). On the other hand, some argue that, in consideration of the fairly technical language used on these platforms, health literacy could be a barrier to effective use of OHWs and specific measures to improve rating and, therefore, use of such resources should be taken

to address the needs of vulnerable groups of users (Coulter, Edwards, Elwyn, & Thomson, 2011).

As crucial constituents of social media, SNSs are online communities created to establish personal relationships (Watermeyer, 2012). Traditional Internet sources can be viewed as "monologs" stored in the form of web pages, newspapers, and journals on the web, whereas information generated by social media are "dialogs" through which users can communicate instantly, pose questions, and obtain feedback from others (Pálsdóttir, 2014). Through social media, users are provided with possibilities for both gathering and disseminating information. Freyne, Berkovsky, Kimani, Baghaei, and Brindal (2010) suggested that SNSs have contributed to the shift from the old healthcare model of one-to-one communication to one-to-many or many-to-many models. Healthcare professionals can share high-quality information through their personal or organizational social networking accounts and users (or viewers) can be potentially motivated to explore topics further (Kim, Lee, & Elias, 2015). Furthermore, the exchange of HI through discussion among friends, acquaintances, or even strangers can accelerate the dissemination of health-related information (Pálsdóttir, 2014), particularly at times of public crisis (Merchant, Elmer, & Lurie, 2011). However, as opposed to traditional HI, insufficient controls and regulations are still affecting users' trust in SNSs (Chretien & Kind, 2013).

Conceptual Framework

The overarching conceptual framework guiding this study (Figure 1) was conceived from several theoretical sources, which helped the authors crystallize the data collection tool to attain the proposed research aims: (a) the theoretical model for the selection of OHI by Zhang et al. (2017), which indicates how different typologies of information seeking (that is, search tasks) can have an impact on information-seeking behaviors and on the selection of the appropriate information channel to perform the search (Vakkari, 2005); (b) Johnson et al.'s (2015) comprehensive model of trust formation in HI contexts, which suggests that authority, style, content, brand,

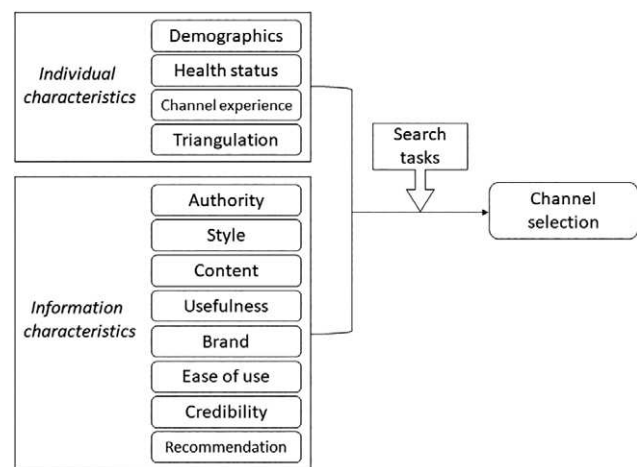


FIG. 1. Conceptual framework.

TABLE 1. Search tasks (adapted from Zhang et al., 2017).

Type	Scenario
Factual	<ol style="list-style-type: none"> 1. A heart attack is a serious medical emergency. Every 7 minutes someone in the UK has a heart attack. According to the British Heart Foundation, approximately 190 people die from a heart attack every day. Imagine that a person around you could have a heart attack. To prepare for it, you decide to go online and look for the proper treatment. 2. Imagine that one of your good friends has been recently diagnosed with depression. His doctor prescribed oral Sertraline (an anti-depressive drug). You are concerned about your friend and want to search for the side effects this medicine may lead to.
Exploratory	<ol style="list-style-type: none"> 1. Imagine that one of your relatives suffers from migraines. You decide to do some research on two new possible treatments you recently heard about. 2. Imagine that you are a diabetes patient and were recently diagnosed with hypertension. Your doctor prescribed you an antihypertensive drug called “renin inhibitors” and you want to make sure it can be taken together with diabetic treatment medicines.
Personal experience	<ol style="list-style-type: none"> 1. Imagine that you have been newly diagnosed with hypertension. You want to know what brands and models of continuous blood pressure monitoring equipment other patients are using. 2. Imagine that you have developed hay fever this year and tried many different allergy drugs, but none of them were very effective. Although the allergy is not very serious it has been troubling you for some time. You decide to go online to find if anyone has had a similar experience.

credibility, ease of use, content, and recommendation have the potential to influence the users’ judgment of OHI and its consequent use. These factors represent “information characteristics” in this research; and (c) a modified version of the Updated Integrative Model of eHealth Use (Bodie & Dutta, 2008), demonstrating that demographics, health status, and channel experience (defined here as the combination of familiarity with and frequency of use of a resource) can affect OHI seeking behaviors. This model has been slightly modified to take into account the importance of triangulating the information found to verify its quality and relevance (Metzger, 2007). All together, these aspects represent “individual characteristics” in this article.

Three types of OHI search tasks were included in this study, namely, *factual*, *exploratory*, and *personal experience* tasks (Table 1). Factual and exploratory tasks were chosen as they have already been used in the scientific

literature (for example, Marchionini, 2006; Wildemuth & Freund, 2012; Zhang et al., 2017). Also, Zhang (2013) investigated these two tasks in the context of HI seeking and found that they had a consistent influence on consumers’ information search behaviors. The reason for selecting personal experience tasks is that they refer to an individual’s specific information need (Westbrook, 2015). Moreover, the personal distinction of health concerns suggests that information seekers need HI that is not only relevant to health conditions but also applicable to their personal social setting and cognitive abilities (Zhang, 2013). People have varying understanding and experience of search tasks and this can be a factor that influences users’ health-related decision-making (Entwistle et al., 2011).

Many previous studies on HI seeking processes focused either on one particular channel, treated the Internet as one general resource, or were qualitative in nature. The questionnaire tool used in this study allows statistical testing of some of the factors identified in qualitative research, which advances understanding of consumers’ channel selection behavior.

Methodology

A quantitative data collection instrument was selected to address the research objectives and a web-based questionnaire comprising four main sections was developed. The first part of the questionnaire involved the selection of the preferred channel/s of information by the respondents when posed in front of a set of possible information need scenarios (search tasks). The second part included rating statements on the respondents’ familiarity with and frequency of use of the different channels (channel experience). The third part comprised a bank of Likert-scale statements, designed to assess participants’ perceptions of the importance of information characteristics in affecting their OHI trust/quality judgments. Each statement was rated through a 5-point Likert scale (from 1 = *not at all important* to 5 = *very important*). The constructs considered were authority (four statements), style (four statements), content (five statements), usefulness (five statements), brand (four statements), ease of use (four statements), recommendation (five statements), and credibility (five statements). Finally, the fourth section of the questionnaire was about respondents’ demographics, including a statement on triangulating habits of the respondents (that is, “I always check HI by consulting several sources”) measured on a Likert scale from 1 = *strongly agree* to 5 = *strongly disagree*.

Due to time constraints surrounding the project and to maximize the response rate, the participants to the study were university students enrolled in various courses only at the authors’ institution. The questionnaire was piloted with a small number of people (12 in total) representative of the target sample to identify discrepancies, confirm the clarity and understandability of the search tasks, and improve readability. The questionnaire was distributed online via the university volunteer email list (comprising all the students

willing to participate in research projects within the university) in July 2017. In total, 304 responses were received and, after the elimination of incomplete records, 291 respondents were retained for statistical analysis.

Three types of HI search tasks (that is, factual, exploratory, and personal experience) were deployed to represent the three major types of HI needs outlined by Zhang et al. (2017). For each search task (Table 1), two specific HI seeking scenarios were designed to reduce the influence of particularity of a single search situation (for example, information familiarity) on channel selection. The tasks, drawn from previous research (Zhang et al., 2017), are completely hypothetical and do not take into consideration the actual health status of the respondents.

Participants were asked to choose the channel/s they would deem more appropriate to use among those listed in Table 2 to undertake each of the six search tasks.

Data were entered in IBM SPSS Statistics 24 (Armonk, NY) for processing and analyses. First, Cronbach's Alpha was utilized to assess and refine the measurement scale regarding information characteristics. Principal Component Analysis (PCA) was then utilized to improve the validity of the questionnaire. The final models were built on the verified information characteristics scale. Poisson regression was applied to predict the respondents' selection of a channel for different task types, as this generalized linear form of regression analysis models count data (Gardner, Mulvey, & Shaw, 1995) which, for this study, were represented by the number of selections for each information channel.

Findings

Sample Characteristics

Table 3 shows the respondents' demographic characteristics. The mean age of participants was 25.5. Two-thirds of the respondents were females, and home students accounted for 58.1% of the sample. The largest number of participants perceived their health status as being very good (40.9%), 29.6% and 18.6% rated it as good and excellent, respectively. The remaining 11% of the participants reported having fair or poor health.

Summarized in Figure 2 are the overall mean values relative to familiarity and frequency of use of the four channels of information. Familiarity was assessed using a Likert scale from 1 = *not familiar at all* to 5 = *very familiar* frequency of use was also assessed using a Likert scale ranging from 1 = *not*

TABLE 3. Profile of participants.

Characteristics	N = 291	
	No. of participants	Percent
<i>Gender</i>		
Male	108	37.1
Female	183	62.9
<i>Student status</i>		
Home	169	58.1
International	122	41.9
<i>Health status</i>		
Excellent	54	18.6
Very good	119	40.9
Good	86	29.6
Fair	25	8.6
Poor	7	2.4

frequent at all to 5 = *very frequent*. Respondents seemed to favor search engines above all other channels, both in terms of frequent use (mean 4.53) and familiarity (mean 4.66), followed by SNSs, OHWs, and, finally Q&A sites. For Poisson regression analyses, the scores for familiarity and frequency were merged together under the term "channel experience."

Final Information Characteristics Model

To improve the validity of the questionnaire, and to investigate the relationships among individual statements, PCA was applied to the data set. The Kaiser-Meyer-Olkin (KMO) value was 0.796, which is higher than the suggested threshold of 0.70 (Kaiser, 1974) and the significance *p* value was <.001, confirming the suitability of the data set for conducting PCA. Table 4 shows the eigenvalues associated with the five resulting components and the variance explained by each regarding the evaluation process related to trust/quality judgments. Specifically, component 1 (credibility) explains the largest percentage of the total variance (24.98%); component 2 (usefulness), 13.09%; component 3 (style), 10.69%; component 4 (ease of use), 7.72%; and component 5 (recommendation), 6.33%. The remaining constructs (that is, authority, content, and brand) did not present significant factor loadings and were discarded. Therefore, after PCA, five constructs and 15 statements were screened as principal components, suggesting a good fit, accounting for 62.81% of variance. The final derived constructs (Table 5) were then used to reflect the information characteristics in the subsequent Poisson regression analyses. The individual item means were calculated based on the questionnaire Likert scale responses and, based on these values, an overall construct mean was subsequently calculated for each of the five constructs.

Channel Selection and Research Tasks

Poisson regression was applied to assess how individual and information characteristics can influence channel selection when performing different search tasks, hence three

TABLE 2. Information channels.

Channels	Examples
Search engines	Google, Bing, Yahoo!, Baidu
Social Q&A sites	Yahoo! Answers, Quora, Baidu, Zhidao
Online health websites (OHWs)	NHS Choices, webMD, NetDoctor
Social networking sites (SNSs)	Facebook, Twitter, Weibo

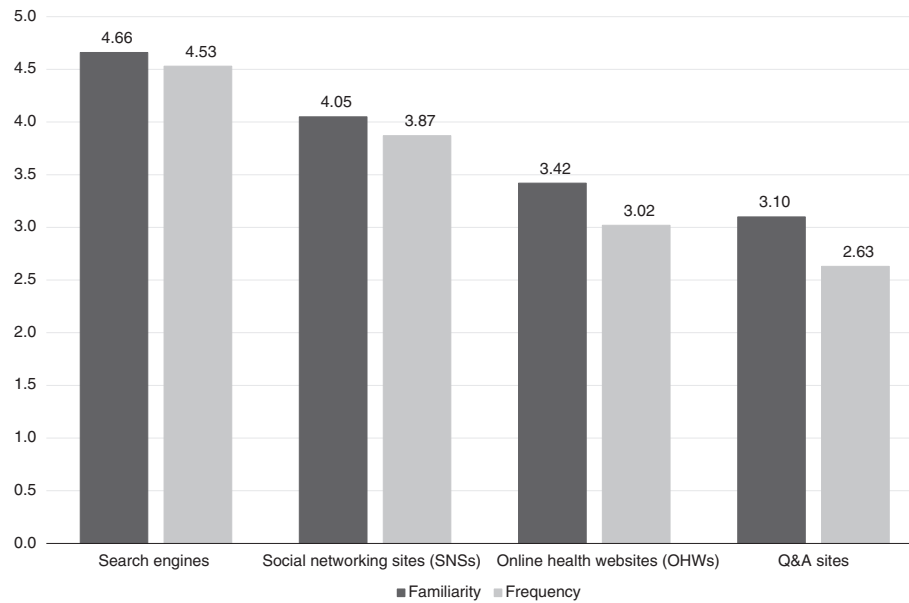


FIG. 2. Overall mean values for familiarity and frequency of use of the four information channels.

TABLE 4. Variance explained by each of the factors identified through PCA.

Component	Initial eigenvalues			Rotation sums of squared loadings		
	Total	Percentage variance	Cumulative percentage	Total	Percentage variance	Cumulative percentage
1	4.74	24.98	24.98	2.52	13.27	13.27
2	2.49	13.10	38.07	2.47	12.99	26.25
3	2.03	10.69	48.76	2.42	12.74	39.00
4	1.47	7.72	56.48	2.30	12.07	51.07
5	1.20	6.33	62.81	2.23	11.74	62.81

separate models were produced and shown in Tables 6 to 8 to reflect each of the task types listed in Table 1. The significant results are reported in bold, as well as the Akaike Information Criterion values (AIC: smaller values indicate a better model fit, Myung, Tang, & Pitt, 2009) and deviance/df (values close to one indicate a better model fit; Myung et al., 2009).

Table 6 reports the regression model of channel selection for factual tasks. This model shows that participants with more channel experience are 38% more likely to use search engines for factual health tasks. Each point increase in channel experience also translates in the increased likelihood of utilizing social Q&A sites (2.31 times), OHWs (1.19 times), and SNSs (1.68 times) for searching factual

TABLE 5. Final measurement model.

Construct	Cronbach's value	Statement	Construct mean	Item mean	SD
Credibility	.729	The objectivity of the information	4.31	4.24	0.81
		The impartiality of the information		4.14	0.89
Usefulness	.710	The extent to which the source contains facts rather than opinions	4.19	4.38	0.78
		The information tells me most of what I need to know		4.13	0.82
		The information helps me to understand the issue better		4.33	0.74
Style	.757	The extent to which I felt that the information helped me	3.79	4.11	0.73
		The ease with which I can read the information		3.92	0.86
		The clarity of the structure of the information		3.83	0.95
Ease of use	.791	The quality of the presentation of the information	3.65	3.63	1.01
		How easy it is to access the information		3.64	1.08
		The speed with which I found the information		3.34	1.17
Recommendation	.770	The information is free	3.26	3.96	1.15
		Family and friends have recommended the source to me		3.43	1.17
		I have seen online recommendations from other users of the source		3.16	1.03
		I have seen recommendations from members of a social network community		2.58	1.11

TABLE 6. Poisson regression model of channel selection for factual tasks.

Predictors	Search engines	Social Q&A sites	OHWs	SNSs
	Exp β (95% CI)	Exp β (95% CI)	Exp β (95% CI)	Exp β (95% CI)
(Intercept)	0.41 (0.10, 1.73)	0.36 (0.00, 0.65)	0.59 (0.18, 0.96)	11.83 (0.14, 15.78)
Gender (male)	1	1	1	1
Gender (female)	0.83 (0.67, 1.02)	0.85 (0.56, 1.30)	0.94 (0.77, 1.15)	1.07 (0.50, 2.32)
Student (home)	1	1	1	1
Student (international)	1.26 (1.00, 1.60)	1.19 (0.73, 1.94)	0.94 (0.75, 1.19)	1.29 (0.51, 3.26)
Age	1.00 (0.99, 1.59)	0.97 (0.93, 1.01)	1.00 (0.98, 1.01)	0.93 (0.84, 1.02)
Health status	1.00 (0.90, 1.13)	0.86 (0.68, 1.07)	0.93 (0.83, 1.03)	0.78 (0.54, 1.14)
Experience	1.38 (1.11, 1.71)	2.31 (1.76, 3.04)	1.19 (1.05, 1.34)	1.68 (1.10, 2.61)
Triangulation	1.05 (0.90, 1.22)	0.99 (0.73, 1.34)	1.09 (0.94, 1.26)	1.29 (0.72, 2.19)
Style	1.00 (0.85, 1.15)	0.65 (0.48, 0.88)	0.95 (0.85, 1.08)	0.61 (0.36, 1.03)
Ease of use	0.98 (0.87, 1.11)	1.11 (0.86, 1.44)	0.95 (0.85, 1.08)	0.70 (0.45, 1.09)
Credibility	0.88 (0.74, 1.04)	1.00 (0.72, 1.38)	1.14 (0.97, 1.34)	0.64 (0.34, 1.22)
Usefulness	1.00 (0.83, 1.20)	1.52 (1.02, 2.26)	1.07 (0.90, 1.27)	0.82 (0.42, 1.60)
Recommendation	1.02 (0.91, 1.16)	1.08 (0.84, 1.39)	1.10 (0.89, 1.12)	1.91 (1.10, 3.33)
AIC	771.40	394.72	789.34	187.47
Deviance/df	0.70	0.70	0.55	0.35

HI. People who perceive the style of the information as important are 35% less likely to use social Q&A site for factual tasks. On the contrary, users who value the usefulness of the information are 52% more likely to use social Q&A sites. In addition, users who prefer the information recommended by others are 91% more likely to use SNSs for factual tasks.

Table 7 illustrates the Poisson regression model for exploratory tasks. Compared to home students, international ones are 28% more likely to use search engines for exploratory tasks. Respondents with more channel experience are more likely to use each of the four channels for exploratory tasks.

Age is also a factor predicting the selection of social Q&A sites for exploratory health tasks as each 1-year increase in age, increases the chance of using this channel by 5%.

Health status and credibility are substantive in predicting the selection of SNSs for exploratory tasks. People in better

health have a 44% less chance of using SNSs for this task type. People who value the credibility of the information are 44% less likely to use SNSs for exploratory tasks.

Table 8 shows the Poisson regression model for personal experience tasks. There are no significant predictors of using search engines and OHWs for this task type.

Higher levels of channel experience translate into an increased likelihood of using social Q&A sites (1.57 times) and SNSs (1.37 times) for personal experience tasks. Participants who tend to compare different online health resources (triangulation) are 23% more likely to select social Q&A sites for this task type.

Health status is the other individual characteristic predictor influencing the likelihood of selecting SNSs to seek HI based on personal experience. People in better health are 16% less likely to use this channel. Usefulness is the only significant predictor of information characteristics. Users who attribute

TABLE 7. Poisson regression model of channel selection for exploratory tasks.

Predictors	Search engines	Social Q&A sites	OHWs	SNSs
	Exp β (95% CI)	Exp β (95% CI)	Exp β (95% CI)	Exp β (95% CI)
(Intercept)	0.28 (0.68, 1.13)	0.73 (0.06, 8.47)	0.80 (0.24, 2.63)	0.98 (0.10, 94.28)
Gender (male)	1	1	1	1
Gender (female)	0.89 (0.72, 1.09)	1.10 (0.66, 1.50)	1.02 (0.84, 1.26)	0.93 (0.45, 1.91)
Student (home)	1	1	1	1
Student (international)	1.28 (1.00, 1.58)	1.15 (0.73, 1.84)	0.90 (0.71, 1.13)	1.33 (0.57, 3.13)
Age	1.00 (0.99, 1.02)	0.95 (0.91, 0.99)	1.10 (0.98, 1.01)	0.91 (0.83, 1.01)
Health status	1.04 (0.93, 1.16)	0.88 (0.71, 1.10)	0.95 (0.81, 1.05)	0.56 (0.38, 0.81)
Experience	1.31 (1.07, 1.62)	2.15 (1.65, 2.80)	1.14 (1.01, 1.29)	1.53 (1.01, 2.32)
Triangulation	1.09 (0.94, 1.27)	0.97 (0.72, 1.30)	1.08 (0.93, 1.25)	0.99 (0.59, 1.66)
Style	1.02 (0.89, 1.19)	0.94 (0.70, 1.26)	0.97 (0.84, 1.12)	0.88 (0.54, 1.42)
Ease of use	0.98 (0.87, 1.10)	0.83 (0.65, 1.05)	0.97 (0.86, 1.09)	0.97 (0.63, 1.48)
Credibility	0.92 (0.78, 1.09)	0.91 (0.66, 1.25)	1.11 (0.95, 1.31)	0.56 (0.33, 0.96)
Usefulness	0.98 (0.82, 1.18)	0.95 (0.68, 1.34)	1.05 (0.88, 1.25)	1.15 (0.58, 2.26)
Recommendation	1.00 (0.89, 1.12)	0.96 (0.75, 1.23)	0.96 (0.86, 1.08)	0.77 (0.49, 1.22)
AIC	789.28	424.86	788.86	214.26
Deviance/df	0.69	0.77	0.57	0.44

TABLE 8. Poisson regression model of channel selection for personal experience tasks.

Predictors	Search engines	Social Q&A sites	OHWs	SNSs
	Exp β (95% CI)	Exp β (95% CI)	Exp β (95% CI)	Exp β (95% CI)
(Intercept)	0.38 (0.09, 1.64)	0.23 (0.50, 1.03)	0.20 (0.41, 0.95)	1.61 (0.25, 10.42)
Gender (male)	1	1	1	1
Gender (female)	0.94 (0.76, 1.17)	0.97 (0.76, 1.23)	0.83 (0.64, 1.08)	1.04 (0.74, 1.45)
Student (home)	1	1	1	1
Student (international)	1.06 (0.83, 1.34)	0.81 (0.61, 1.06)	1.20 (0.89, 1.61)	1.13 (0.79, 1.62)
Age	1.00 (0.99, 1.02)	0.98 (0.96, 1.00)	1.01 (0.99, 1.03)	0.98 (0.95, 1.01)
Health status	0.96 (0.85, 1.08)	1.05 (0.92, 1.20)	0.92 (0.80, 1.06)	0.84 (0.71, 0.99)
Experience	1.22 (0.98, 1.50)	1.57 (1.35, 1.83)	1.20 (0.98, 1.47)	1.37 (1.13, 1.67)
Triangulation	1.07 (0.91, 1.25)	1.23 (1.03, 1.47)	0.96 (0.79, 1.16)	1.13 (0.88, 1.44)
Style	0.97 (0.83, 1.13)	0.96 (0.81, 1.14)	1.02 (0.87, 1.19)	1.03 (0.81, 1.30)
Ease of use	0.97 (0.85, 1.10)	0.92 (0.80, 1.06)	1.06 (0.86, 1.30)	0.90 (0.75, 1.10)
Credibility	1.02 (0.85, 1.21)	1.14 (0.94, 1.39)	1.20 (0.95, 1.52)	0.93 (0.71, 1.21)
Usefulness	0.97 (0.80, 1.17)	1.02 (0.84, 1.25)	0.97 (0.83, 1.12)	0.75 (0.57, 0.99)
Recommendation	1.02 (0.90, 1.15)	0.92 (0.80, 1.06)	1.15 (0.98, 1.34)	1.04 (0.85, 1.28)
AIC	790.15	707.93	714.66	585.46
Deviance/df	0.85	0.88	1.10	1.11

importance to the usefulness of HI are 25% less likely to use SNSs for personal experience tasks.

Discussion

The Impact of Information Characteristics on Channel Selection

PCA has identified credibility, usefulness, style, ease of use, and recommendation as the most important information characteristics in OHI seeking processes, without taking into account channel selection. These same five constructs have also been identified in previous studies on trust formation (Johnson et al., 2015; Rowley et al., 2015). However, information characteristics are influential factors only when predicting the selection of social Q&A sites and SNSs.

Credibility is the most significant information characteristic identified through PCA (mean 4.31), which is consistent with the findings of Johnson et al. (2015), Johnson, Sbaffi, and Rowley (2016), and Rowley et al. (2015). Users' concern for HI credibility leads to a decreased likelihood of selecting SNSs for exploratory HI search tasks. Compared with traditional HI providers, the quality and effectiveness of OHI from SNSs can vary due to a lack of efficient regulations (Griffiths et al., 2012; Pálsdóttir, 2014). In addition, SNSs usually gather groups of people with various backgrounds and interests, and the social ties among users may be weak and superficial, creating an environment that is poorly conducive to trust (Ye, 2011).

The extent to which users can understand and utilize the OHI (usefulness) has emerged from the PCA as the second most influential information characteristic (mean 4.19). Usefulness has been considered an antecedent of credibility regarding digital information in different contexts such as information focus (Fogg et al., 2003), personalization, and empathy (Sillence, Briggs, Harris, & Fishwick, 2007). Usefulness is a crucial predictor for

choosing social Q&A sites for exploratory tasks. This is unsurprising, because social Q&A sites offer a more interactive search experience and a variety of user-generated information within seconds, making seeking HI through this channel easy to understand (Bowler et al., 2015) and more effective (Liu & Jansen, 2013). In contrast, the influence of usefulness on the selection of SNSs for personal experience is different. Users who give priority to this aspect of the information show less likelihood of using SNSs for this task type because the information supplied tends to come from lay people with varying degrees of expertise and experience (Liu & Jansen, 2013). Furthermore, insufficient controls and regulations can hinder the sharing of OHI on SNSs (Pálsdóttir, 2014).

Style refers to "the way in which the information is presented and written" (Rowley et al., 2015, p. 320). Fergie, Hunt, and Hilton (2013) suggested that young adults favor a professional presentation of OHI, whereas Ye (2011) found that understandability has a stronger impact on judgments of OHI. In this research, style (mean 3.79) refers to the clarity of the information and the overall quality of the presentation (for example, lack of spelling mistakes). People who value these aspects are less likely to use social Q&A sites for searching exploratory health tasks, because the style of these is informal and conversational and the volume of available information is too vast (Golbeck & Fleischmann, 2010; Liu & Jansen, 2013).

Ease of use refers to the easiness with which users access and use the information. Unlike previous studies (Fogg et al., 2003; Sillence et al., 2007), in this research ease of use (mean 3.65) includes design aspects of websites as well as users' personal experience. Ease of use appeared as the dominant trust formation influencing factor in Rowley et al. (2015) when considering first-year undergraduate students; however, the same construct ranked much lower for third-year undergraduate students (Johnson et al., 2015), who attribute more importance to credibility, usefulness, style, and content. The result of the present study is more in

line with that of Johnson et al. (2015), possibly because of the nature of the student sample, which was not year-specific.

Recommendation is the last of the influencing information characteristics that emerged from the PCA (mean 3.26), in agreement with Rowley et al. (2015) and Johnson et al. (2016). Other studies have also confirmed that young adults usually turn to their families and close social networks for advice in HI seeking and trust judgments (for example, Hargittai, Fullerton, Menchen-Trevino, & Thomas, 2010; Rieh & Hilligoss, 2007). People who favor HI recommended by others tend to use SNSs for seeking factual HI, in line with findings from Gray, Ellison, Vitak, and Lampe (2013). Moreover, professional health providers and patient groups on SNSs provide information seekers with expert advice and specific OHI recommendations (Young, 2011).

The Impact of Individual Characteristics on Channel Selection

Channel experience is the most crucial predictor for channel selection, which is positively related to the selection of search engines, social Q&A sites, OHWs, and SNSs for factual and exploratory tasks and to the selection of social Q&A sites and SNSs for personal experience tasks. The relevance of channel experience is to be expected, as people's behavior can be efficiently predicted by past habits and practices (Ajzen, 2002). This is also consistent with the principle of the least-effort rule regarding information channel access, which advocates source accessibility as a dominant factor in channel selection due to the fact that experience can significantly improve the accessibility of HI (Xu, Tan, & Yang, 2006). However, there are also situations where channel experience is not significant. Compared with the selected rate of search engines and OHWs for factual and exploratory tasks, the corresponding figures for personal experience tasks are relatively low. This is consistent with findings from Xu et al. (2006), who claimed that the least-effort principle was not related to personal searches. It can be assumed that, when users search for OHI regarding personal issues, search engines and OHWs have a relatively low importance and can be replaced by social Q&A sites and SNSs to some extent. This can be explained by the fact that social Q&A sites and SNSs are online social platforms that provide users with the chances to interact with real people and obtain information that is tailored to their specific needs. In fact, these two channels enable HI seekers to conduct searches regarding personal matters by allowing them to communicate with "distributed potential respondents," and to gain "more subjective and personalized information" (Jeon & Rieh, 2013; Morris, Teevan, & Panovich, 2010). This is still difficult to achieve through a traditional web search (Jeon & Rieh, 2013).

Health status is a significant predictor for choosing SNSs for exploratory and personal experience tasks. People with better health conditions are less likely to choose SNSs for performing these two search types. According to Gray et al. (2013), people prefer using SNSs to ask specific questions and gain factual knowledge. However, people are generally

unwilling to use SNSs (especially Facebook) for seeking HI, unless their conditions are generally mild (De Choudhury et al., 2014; Zhang et al., 2017).

Finally, users who like selecting and comparing HI from different sources (triangulation) show a higher likelihood of using social Q&A sites for personal experience tasks. The easy access to a wide online community and the content openness of social Q&A sites enable information seekers to gain a quick understanding of their health conditions from both professionals and those with similar symptoms (Adamic et al., 2008).

Only a few demographic aspects have reported statistically significant results in terms of channel selection, specifically, age and student status (home vs. international) for exploratory tasks. With respect to age, for each 1-year increase, there is a 5% increase in the chance of using Q&A sites for exploratory tasks. A recent literature review by Zhao and Zhang (2017) showed how the use of this channel of information is a favorite among people up to 30 years of age, as it can offer personalized and effective HI. The fact that international students are 28% more likely to use search engines than home students proved to be difficult to explain due to the complex mix of nationalities and cultures being encapsulated in the term "international." This aspect would require a more granular research design to be properly addressed.

This study offers several practical implications. First, it revealed the individual and information differences in selecting online channels for different types of HI tasks. The design of online resources can be modified to make the necessary changes that take into consideration personal characteristics and information needs. In addition to providing easy access by promptly displaying the results, search engines can offer relatively advanced options, such as "see how others have discussed this topic" (a link to a social conversation from social Q&A sites). Similarly, search engines can also provide quick links to SNSs, such as "post this question on Twitter" so as to allow information seekers to find more HI or validate the information obtained elsewhere. This study also confirmed the validity of a measurement scale for information characteristics regarding users' OHI quality and trust judgments.

Limitations

First, because this study was conducted on a convenient sample, its generalizability needs to be verified through a more robust sampling technique. Second, the channel selection models might be incomplete because the constructs of content, brand, familiarity, and authority were removed from the PCA model, and a different sample might have returned different factors. Third, personal characteristics including channel experience and information habits were measured in a nonvalidated scale and more dimensions, such as perceived quality and interactivity, should be included. Fourth, health literacy, income, and race, as substantive influential factors regarding channel selection (Weaver et al., 2010; Zhang et al., 2017), were excluded from this study. Fifth, only a

minority of the respondents (11%) rated their health as fair or poor and might have had difficulties relating to some of the tasks, resulting in potential bias of some of the results. Last, this study did not explicitly ask respondents to order channels according to their preferences when undertaking the HI search scenarios; interviews to explore deeper reasons behind the selection could improve the interpretation of the findings.

Conclusion

To examine the individual and information characteristics that influence users' channel selection of OHI, a quantitative, questionnaire-based research approach was applied to a sample of 291 university students in the UK. Search engines were the overall preferred OHI channels, followed by social media networking sites, online health websites, and Q&A sites. PCA showed that credibility, usefulness, style, ease of use, and recommendation are reliable constructs in the evaluation of OHI. Differences in channel selection of OHI are due to individuals' channel experience, age, student status, health status, and triangulation (comparing sources) as well as the style, credibility, usefulness, and recommendation of information. These findings suggest that current information channel selection is a very complex process, dependent on both individual and source factors. Further research is required to fully understand such processes and public health organizations and OHI providers should consider users' preferences and needs when designing and implementing new channels to promote and distribute OHI.

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