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A Content Analysis of Publication Trends in Internet-Focused Healthcare Communication Research: A Look at the Past and Potential Future of the Field

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Abstract

Both healthcare professionals and scholars are recognizing the potential of the Internet as a valuable channel for health communication. Compared with traditional media channels, the Internet has expanded the range of an individual's health information seeking behavior. Although some research has shed light on the trends, patterns, and directions in general health communication scholarship, research addressing Internet-focused topics has not yet been undertaken. This study explored the trends in discipline, topic, theory, and methodology of Internet-focused research in nine top-ranked journals over sixteen years. The findings identified some notable trends and potential future directions of the field. The authors found that Internet-focused research in health communication is highly interdisciplinary. For example, researchers from both communication- and medical-related fields have contributed to this field of research. Published research about the Internet and new communication technologies in the nine journals have increased greatly over sixteen years. For instance, the number of published studies about Internet-focused research increased from 0 in 1997 to 36 in 2012. A wide range of diverse topics have been investigated, such as health information seeking, online social support, and advancements in health care. In addition, a limited number of theories and methodologies have been employed across studies. The results showed only a small amount of Internet-focused health communication articles used explicit theoretical frameworks. Interdisciplinary research efforts, specifically between scholars from communication and health-related fields are strongly encouraged to investigate Internet health communication phenomena. In addition, health communication scholars are encouraged to develop and test theories that specifically deal with new media topics.

Keywords: Communications media; Data collection; Health communication; Interdisciplinary studies; Internet; Methodology

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Introduction

The Internet has rapidly changed our economics, social structure and information consumption since its creation. This change can be observed in the large number of individuals who seek and obtain health-related information from the Internet. Compared with traditional media channels, the Internet has expanded the range of an individual's health information seeking behavior. Individuals are now able to receive health advice, provide feedback, and seek online social support in a

timely and interactive manner [1]. A recent survey showed that health-related information is one of the most important topics in online searching [2]. The Pew Internet and American Life Project reported that 80% of American adult Internet users searched for health-related information regarding a wide range of topics, including disease identification, treatment, medicine, health insurance, doctor recommendations, and health tips [3].

Other than health information seeking, another aspect of online health communication is information exposure. With

the development of social media in recent years, individuals who have personal stories are able to present, share, and frame health information in the online community both verbally and visually. Internet users are not only seeking health information but are also actively creating health-related content (both healthy and unhealthy). For example, Holmberg et al. found that the majority of images posted by adolescents on Instagram were unhealthy, containing low nutrition and high amount of calories [4]. They concluded that adolescent social media users influenced peers' perception about food, and helped promote the brands by participating in the advertising. Another study by Hindman et al. found that Instagram posts and hashtags have the ability to increase the general public's knowledge of health issues [5]. Such exposure and interactive online sharing activities shape individuals' perception, attitudes, and behaviors about certain health topics.

The Internet is growing in influence. The advance of digital technologies has made online connectedness more relevant than ever. The Internet provides an opportunity for users to create and share useful information and make it influential and powerful. In the past several decades, a digital revolution that has brought significant changes to society has influenced almost every aspect of people's lives. Health care communication is a field that the Internet has changed dramatically. As Douglas Goldstein states "Internet technology and interactive communications are revolutionizing all aspects of health and medical communications, communities, commerce, and care delivery [6]."

As consumers' use of the Internet for health information continues to grow, Internet-focused health communication topics has gained scholarly attention among researchers who seek to explore the influence of Internet technology on various health issues. Researchers have approached a number of health topics including advancements in healthcare, aging and care giving, health disparities, health information seeking, medical treatments, and many others. Such studies have centered on how the Internet plays a role in the health communication process, data collection, and development of prevention strategies [7,8]. As considerable amount of Internet-focused health communication studies have been published over the past several decades, it would be helpful to examine if any established trends exist in the literature. Therefore, the primary focus of this study is to examine published health communication research that specifically addresses Internet use and its effects on individuals' health attitudes and behaviors.

Although some research has shed light on the trends, patterns, and directions in general health communication scholarship, research addressing Internet-focused topics has not yet been undertaken. This study attempts to bridge the gap in the literature and explore to what extent scholars publish Internet-focused research in major communication, health communication, and new communication technology journals; the disciplinary, topical, theoretical, and methodological trends of Internet-focused research in these journals. Because of the interdisciplinary nature of the field of health communication, the authors will examine these themes from a cross-disciplinary perspective.

Literature Review

Research themes about the internet in health communication scholarship

The field of health communication research was established distinctly in the 1980's, and continues to grow into a mature, interdisciplinary field of study [9,10]. A number of scholars have analyzed publication trends and patterns regarding health themes [9,11,12]. For example, Beck et al. analyzed the frequency, topics, theoretical frameworks, and methodological approaches for published health articles in general communication journals, concluding that a wide range of topics, methodologies, and theoretical orientations appeared in communication journals [9]. Kim et al. exclusively analyzed publication trends in the journal, Health Communication, across a 22-year timeframe. Although it provided longitudinal and historical insights into the development of health communication and offered notable trends within the discipline, this study was limited because it was restricted to one journal [11]. More recently, Nazione et al. examined research published in Health Communication and Journal of Health Communication and offered comparison in terms of publication trends of the two journals [12]. These previous analyses have established the groundwork by identifying the trends, patterns, and future directions in health communication research through reviews of top-ranked journals. Continuing this line of inquiry, the current study assesses publication patterns and trends for Internet-focused research in the health communication field.

Researchers have realized the importance of examining Internet-focused phenomena in health communication scholarship. In the editor's note of the special issue "Web 2.0 and Health Communication" in the Journal of Health Communication, Ratzan pointed out the potential of the Internet as one of the communication technologies in the field in terms of advancing health care, physician-patient communication, and health information seeking [13]. Examining such important health topics and exploring how Internet technology has helped promote the advancement allows researchers and practitioners to recognize the strengths and weaknesses of Internet-focused health communication research.

Among the diverse health research themes about the Internet, online health information seeking has been one of the most salient topics. Scholars employed a variety of research methods such as content analyses, experimental designs, and surveys to examine health information seeking behavior on blogs, online forums, websites, and many other online platforms. In terms of topics, research has examined the relationship of news coverage and online searches of information [14], public anxiety and online information searching behavior [15], and many others. Another line of research examined how specific groups, such as cancer patients [16-18], older adults [19,20], and teenagers use the Internet for accessing health information [21].

Online social support has also been extensively studied as a key determinant of health [22]. Rains and Young conducted a meta-analysis of online support group research [23]. They

found positive health outcomes including, increased offline social support, depression reduction, better quality of life, and increased self-efficacy. The study suggested further research was necessary to understand the functions and outcomes of computer mediated online support groups. Other topics include social support messages on YouTube [24], social and psychological determinants of levels of engagement of online support group [25], and the relationship of online support group and online information seeking [26]. Scholars also have found that the sense of empowerment could mediate social support and intention to actively communicate with the physicians [22].

Computer mediated provider-patient communication has also been one of the key areas of research in health communication [27]. Scholars have explored a number of topics within this area, including strategies used by physicians to interact with Internet-informed patients [28], satisfaction/dissatisfaction with provider-patient communication [29], and data sharing [30]. For example, Tustin examined patient satisfaction and its role in online health information seeking [29]. The study revealed that patients were more likely to seek and trust online health information if they dissatisfied with patient-provider communication. These studies highlight the importance of physician-patient communication and the role of the Internet in improving this communication process.

Previous analyses of Internet-focused research in general communication publications often demonstrated a common characteristic, primarily, that the research often lacked theoretical foundations and presented only descriptive explanations of Internet phenomena. To assess the relationship between Internet-focused research and health communication, we propose the following research questions:

- RQ₁: What are the publication trends of Internet-focused health communication research?
- RQ₂: What are the disciplinary trends of Internet-focused health communication research?
- RQ₃: What are the topical trends of Internet-focused health communication research?
- RQ₄: What are the theoretical trends of Internet-focused health communication research?
- RQ₅: What are the methodological trends of Internet-focused health communication research?

Methods

Sampling procedure

This study examined a comprehensive sample of all the published Internet-focused health communication research articles in nine journals between 1997 and 2012. This timeframe was selected because Internet technology did not start to diffuse to the general public until early to mid-1990's [31], and previous research has demonstrated that before 1997; only a limited amount of Internet-focused studies had been published in communication journals [32]. Therefore, the year 1997 was selected as the starting point for the analysis.

To collect data, we referred to the sampling procedures of prior research [32]. Previous studies selected journals from two main categories: leading communication journals and journals that specifically published new technology research. Because this study examined Internet-focused research in the health communication field, the authors extended this typology and divided the journals into three categories:

1. Leading communication journals.
2. Internet- and new technology-specific journals.
3. Leading health communication journals.

Accordingly, we selected five journals from the leading communication journals category. They were Communication Research, Human Communication Research, Journal of Broadcasting and Electronic Media, Journal of Communication, and Journalism & Mass Communication Quarterly. In addition, we selected two new communication technology-specific journals: Journal of Computer-mediated Communication and New Media & Society. In the field of health communication, the researchers selected two journals: Health Communication and Journal of Health Communication. The two journals were selected because they were top ranked journals in the Social Science Citation Index and were viewed as the most influential journals in health communication scholarship [11]. In general, there were two reasons for the journal selection. First, by keeping the selection criteria consistent with past studies, we hoped to increase the comparability and generalizability of the findings in regards to the journals in the study. Second, the journals were selected based on their influential factors and rankings in the communication and health communication fields.

To select qualified published research articles, the researchers conducted keyword searches for article titles and abstracts in the Communication and Mass Media Complete database using the nine journals as sources. The keywords used were: Internet, computer, World Wide Web, online, new media, email, blog, Facebook, Twitter, discussion boards, IM, and E-health. Specifically, on the Communication and Mass Media Complete database search page, we selected "Journal Title" (JN) as the search source, AND "keyword" in title (TI), OR "keyword" in abstract (AB). Then we displayed the articles by clicking "sort by date". This way we were able to search all the articles with the keywords in the titles or abstracts in each journal. Title keyword searches have been considered efficient in identifying research articles for analysis by prior researchers [10]. After this keyword search, the authors also manually browsed all the publications in each journal within the time frame, aiming to identify any missed articles from the first round. These procedures allowed the researchers to compile a comprehensive sample of published Internet-focused health communication studies in the nine journals.

The articles were then sorted by journal titles in separate folders, omitting duplicate articles. This procedure yielded 172 Internet-focused health communication articles. Each published peer-review research article constituted the unit of analysis. Editorials,

book reviews, and other materials were excluded from the analysis.

Coding schemes

This study defined health communication research as any research study that examined “the important roles performed by human and mediated communication in healthcare and health promotion in a wide range of social contexts” [10]. Two coders with communication-specialized graduate education coded the journal articles based on general information including the journal title, article title, year of publication, and the names and affiliations of authors. The researchers also coded topics, theoretical frameworks, research methods, sampling techniques, sample sizes, units of analysis, and response rates of each article. The coding scheme was adapted from Cho and Khang’s coding guidelines [32,33].

Authors and disciplines: Each author and his/her affiliation were recorded. This category was developed because we attempted to access the productiveness of individual authors and institutions. In addition, because of the interdisciplinary nature of health communication, we attempted to understand the collaboration status of research devoted to Internet-focused topics in health communication scholarship.

Topics: We developed this coding item intending to cover the scope of the research topics about Internet-focused health communication. Research topics referred to the primary focus or subject of each article [32]. Based on research topics identified by prior Internet-focused and health-focused research reviews [8,32], the authors analyzed topics in two categories: Research topics and health issue topics. Research topics included:

- Advancements in health care.
- Aging and care giving.
- Disparities in health communication.
- Environmental risks.
- Health information seeking and using.
- Online social support.
- Organ donation.
- Patient-physician relationship.

Health issue topics were AIDS/HIV/STD/safer sex, alcohol, birth-related issues, cancer, drugs and other medical treatments, exercise and fitness, mental health, nutrition and healthy eating, smoking. The coders selected a single topic for each study based on the primary focus of the article. This decision was reached via consensus of the two coders.

Theory application: We examined whether the articles had explicit theoretical frameworks. If an article had explicit theoretical frameworks, we also coded which theories were used.

Research methods: The authors examined the specific research methods employed in the articles, including content analysis, experiment, survey, interview, focus group, and critique/essay.

We also identified if the articles used qualitative or quantitative research methods. In terms of data collection, we examined if the articles used online or offline methods to collect data. We also examined the sampling methods used by the articles. They were probability and non-probability sampling methods. In addition, this study examined the response rate, sample size, and sample population of each research article. The items of the sample population were experts, general population, patients, students, and others.

Coding procedures

The full-length articles were downloaded and sorted for analysis. The two coders were trained for 20 h in the coding procedures and coded the articles in the sample. Conceptual and operational definitions for the coding categories were described in detail during training sessions. The two coders independently coded 15% (n=27) of the total sample to determine intercoder reliability. Any disagreements were discussed and resolved as necessary. Krippendorff’s alpha exceeded 0.80 for all pairs of coding variables. Krippendorff’s alpha is a widely accepted measure of reliability in content analysis. It offers advantages because “it can be used regardless of the number of observers, levels of measurement, sample sizes, and presence or absence of missing data” [33]. Specifically, the intercoder reliabilities for each category were: journal title (1.0), year of publication (1.0), name and affiliation of authors (1.0), research topics (0.81), theory application (0.87), research methods (0.90), quantitative vs. qualitative (0.92), sampling methods (0.91), sample size (0.91), unit of analysis (0.89), response rates (0.90), and population (0.80).

Results

Trends of publication

During the time period of 1997 and 2012, the total of number of published Internet-focused health communication articles in the nine journals was 172. Among them, the Journal of Health Communication published the most Internet-focused research articles about health topics (n=86, 50%), followed by Health Communication (n=49, 28.5%). The two new communication technology journals, Journal of Computer-Mediated Communication (n=14, 8.1%) and New Media and Society (n=7, 4.1%) both had relatively high numbers of Internet-focused health communication articles. In terms of general communication journals, Communication Research had the highest proportion of Internet-focused research articles about health topics (n=6, 3.5%), followed by Human Communication Research (n=4, 2.3%), Journal of Broadcasting and Electronic Media (n=4, 2.3%), and Journal of Communication (n=3, 1.7%) (**Table 1**).

The publication trends of Internet-focused research articles about health topics across the three journal categories are demonstrated in **Figure 1**. The results revealed an increase in the number of Internet-focused research articles in health topics during the 16-year period. Overall, the two health communication journals, the Journal of Health Communication and Health

Table 1: Proportion of internet-focused health communication research articles in nine journals.

Journal Category	Journal Name	Number	%
HCJ	Journal of Health Communication	86	50%
	Health Communication	48	27.9%
NCTJ	Journal of Computer-Mediated Communication	14	8.1%
	New Media & Society	7	4.1%
GCJ	Communication Research	6	3.5%
	Human Communication Research	4	2.3%
	Journal of Broadcasting & Electronic Media	4	2.3%
	Journal of Communication	3	1.7%
	Journalism & Mass Communication Quarterly	0	0%
Total		172	100%

Note: HCJ: Health Communication Journals; GCJ: General Communication Journals; NCTJ: New Communication Technology Journals

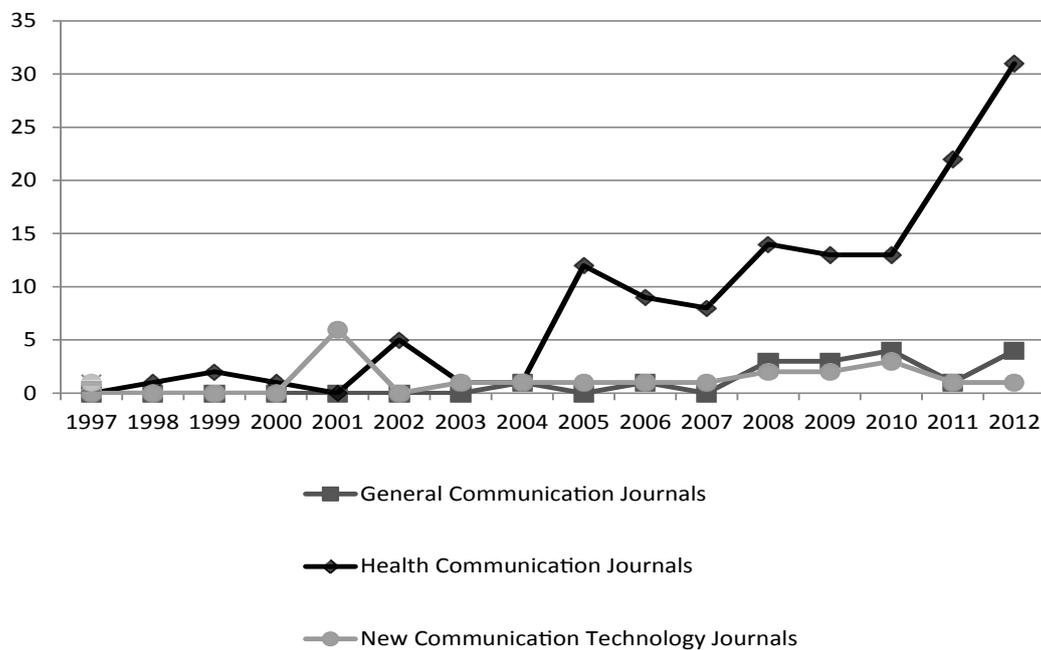


Figure 1 Internet-focused health communication research publication trends in three journal categories.

Communication, demonstrated an increase in the number of Internet-focused research since 2004. Notable increases in terms of the numbers of the Internet-focused health communication articles occurred in the years of 2002, 2005, and 2011 for the Journal of Health Communication. More articles about Internet-focused health communication were published after 2008 in the other seven communication journals.

Authors and disciplines

Regarding RQ₂, a total number of 562 authors from the fields of communication, medicine, public health, psychology, information sciences and others published Internet-focused health communication research in the nine journals, with individual authors primarily from academia (n=461, 82.0%), followed by the private sector (n=100, 17.8%). An examination of authors' affiliations revealed a dominance of medical- and health-related fields over communication-related fields. A total

of 243 (43.2%) individual authors were from medical- and health-related fields, and 175 (31.1%) were from communication-related fields. The remaining authors were from other disciplines such as psychology, sociology, and information sciences.

For the two of the three journal categories, a Chi-square analysis of the journals and authors' disciplines showed significant results, $\chi^2(1, N=562)=6.86, p<0.01$. Specifically, for health communication journals (i.e., Health Communication and Journal of Health Communication), the authors from medical- and health-related fields (n=222, 39.50%) were more numerous than the authors from communication-related fields (n=145, 25.80%). By contrast, for communication journals, more researchers from the communication-related disciplines (n=30, 5.34%) published Internet-focused research about health communication than scholars from medical and health-related disciplines (n=21, 3.74%).

Collaboration status

The majority of the studies were collaborative work by multiple authors (n=137, 79.7%). However, most of the collaborations were within one discipline instead of between multiple disciplines. For example, approximately one third of the articles relied on collaboration within the communication field (n=60, 34.9%), and approximately one fifth of the studies were conducted by collaboration within health-related discipline (n=40, 23.3%). Only seventeen studies (9.9%) were conducted based on the collaboration between communication scholars and health scholars.

Topics

This study identified eight research topics and nine health issue topics in the published articles (Table 2). Among research topics, health information seeking and using was the most frequently studied area (n=41, 23.8%), followed by online social support (n=14, 8.1%). Among health issue topics, the most frequently examined was cancer (n=28, 16.3%), followed by AIDS/HIV/STD/safer sex (n=15, 8.7%). Aging and care giving (n=1, 0.6%), organ donation (n=1, 0.6%), and mental health (n=1, 0.6%) were the least studied topics in the two combined categories (Table 2).

Theoretical application

Explicit theoretical frameworks were absent for a majority of the articles (n=116, 67.4%). Only 56 (32.6%) Internet-focused health communication articles used explicit theoretical frameworks. Theories applied most often were the Extended Parallel Processing Model (EPPM) (n=5) and Social Cognitive Theory (n=5), followed by Grounded Theory (n=4), Uses and Gratification (n=3), Health Belief Model (n=2), Knowledge Gap (n=2), and Transtheoretical Model (n=2). A total of 42 theories and models have been used at least once.

Research methods

In general, quantitative methods (n=127, 73.8%) were dominant across the nine journals, followed by qualitative (n=37, 21.5%) and mixed methods (n=8, 4.7%). Specifically, survey was the most frequently used methods (n=51, 29.7%), followed by content analysis (n=41, 23.8%), experiment (n=29, 16.9%), and critique/essay (n=12, 7.0%). In aggregating all nine journals, over a half of the articles (n=101, 58.7%) used online data collection techniques, while 47 (27.3%) used offline data collection techniques. Only a small portion (n=8, 4.7%) of the articles used a combination of online and offline data collection methods. Concerning sampling techniques, the majority of the articles used non-probability sampling methods (n=111, 64.5%) across all nine journals, whereas probability sampling methods were not frequently used (n=42, 24.4%). A Chi-square analysis of the journal categories and sampling technique showed significant results, $\chi^2 (1, N=172) = 18.50, p < 0.01$. Specifically, articles published in health communication journals employed more probability (n=33, 78.6%) and nonprobability sampling techniques (n=89, 80.2%) than the ones in the other two journal categories. In terms of sample types, general population (n=59, 34.3%) was the most frequent population type among the 108 articles that mentioned a sample population, followed by patients (n=23, 13.4%), and students (n=20, 11.6%) (Table 3).

We recorded the sample size based on different research methods. For content analysis studies, the average sample size was 203 (n=41). For survey studies, the average sample size was 424 (n=51), with an average response rate 49.93%. For experiments, the average sample size was 217 (n=29). The mean sample size was smaller for interview (n=24) and focus group studies (n=37.5) compared to the other methods.

Table 2: Proportion of topics of internet-focused health communication research.

Topics	Journal Category				Total (%)
	HCI (%)	GCI (%)	NCTJ (%)		
Research topics	Health information seeking and using	26 (15.1)	5 (2.9)	10 (5.8)	41 (23.8)
	Online social support	11 (6.4)	3 (1.7)	0 (0)	14 (8.1)
	Advancements in health care	8 (4.7)	0 (0)	0 (0)	8 (4.7)
	Disparities in health communication	7 (4.1)	1 (0.6)	0 (0)	8 (4.7)
	Patient-physician relationship	6 (3.5)	1 (0.6)	1 (0.6)	8 (4.7)
	Environmental risks	3 (1.7)	0 (0)	1 (0.6)	4 (2.3)
	Aging and care giving	0 (0)	1 (0.6)	0 (0)	1 (0.6)
	Organ donation	0 (0)	0 (0)	1 (0.6)	1 (0.6)
Health issue topics	Cancer	24 (14)	2 (1.2)	2 (1.2)	28 (16.3)
	AIDS/HIV/STD/Safer sex	12 (7.0)	1 (0.6)	2 (1.2)	15 (8.7)
	Smoking	7 (4.1)	0 (0)	2 (1.2)	9 (5.2)
	Nutrition and healthy eating	7 (4.1)	0 (0)	0 (0)	7 (4.1)
	Drugs and other medical treatments	5 (2.9)	1 (0.6)	0 (0)	6 (3.5)
	Exercise and fitness	3 (1.7)	0 (0)	1 (0.6)	4 (2.3)
	Alcohol	2 (1.2)	0 (0)	0 (0)	2 (1.2)
	Birth-related issues	1 (0.6)	0 (0)	1 (0.6)	2 (1.2)
	Mental health	1 (0.6)	0 (0)	0 (0)	1 (0.6)
	Others	12 (7.0)	1 (0.6)	0 (0)	13 (7.6)
Total	135 (78.5)	16 (9.3)	21 (12.2)	172 (100)	

Table 3: Data collection techniques, sampling methods, and sample types of articles across nine journals.

		HCI (%)	GCJ (%)	NCTJ (%)	Total (%)
Data collection techniques	On-line	83 (48.3)	10 (5.8)	8 (4.7)	101 (58.7)
	Off-line	35 (20.3)	4 (2.3)	8 (4.7)	47 (27.3)
	Combined	8 (4.7)	0 (0)	0 (0)	8 (4.7)
	Unknown	9 (5.2)	2 (1.2)	5 (2.9)	16 (9.3)
Sampling methods**	Non-probability	89 (51.7)	6 (3.5)	16 (9.3)	111 (64.5)
	Probability	33 (19.2)	9 (5.2)	0 (0)	42 (24.4)
	Both	1 (0.6)	0 (0)	0 (0)	1 (0.6)
	Unknown	12 (7.0)	1 (0.6)	5 (2.9)	18 (10.5)
Sample types	General population	46 (26.7)	7 (4.1)	6 (3.5)	59 (34.3)
	Patients	19 (11)	2 (1.2)	2 (1.2)	23 (13.4)
	Student	14 (8.1)	4 (2.3)	2 (1.2)	20 (11.6)
	Experts	3 (1.7)	0 (0)	1 (0.6)	4 (2.3)
	Others	2 (1.2)	0 (0)	0 (0)	2 (1.2)
	Do not apply	51 (29.7)	3 (1.7)	10 (5.8)	64 (37.2)
Research methods	Quantitative	107 (62.2)	13 (7.6)	7 (4.1)	127 (73.8)
	Qualitative	23 (13.4)	0 (0)	14 (8.1)	37 (21.5)
	Mixed	5 (2.9)	3 (1.7)	0 (0)	8 (4.7)
	Survey	40 (23.3)	7 (4.1)	4 (2.3)	51 (29.7)
	Content analysis	37 (21.5)	1 (0.6)	3 (1.7)	41 (23.8)
	Experiment	22 (12.8)	5 (2.9)	2 (1.2)	29 (16.9)
	Critique/essay	10 (5.8)	0 (0)	2 (1.2)	12 (7.0)
	Interview	6 (3.5)	0 (0)	3 (1.7)	9 (5.2)
	Focus group	4 (2.3)	0 (0)	0 (0)	4 (2.3)

Note: HCI: Health Communication Journals; GCJ: General Communication Journals; NCTJ: New Communication Technology Journals. **Denotes p < 0.01

Discussion

Compared with prior research that focused on traditional topics in health communication scholarship [9,11,12], this study sheds light on the trend of published research of an increasingly important issue (i.e., the Internet) in health communication. Recognizing its interdisciplinary nature, this study not only examines articles published in key health communication journals, but also considers articles of health-related topics in major communication and new communication technology journals, in the hope of shedding light on the interdisciplinary comparison across different scholarships. By examining the research trends in terms of disciplines, topics, theoretical frameworks, and methodologies, this study hopes to provide a comprehensive picture of research trends and patterns of Internet-focused research in health communication scholarship. Our findings offer insights for future research agendas aimed at improving the breadth and depth of health communication scholarship.

Overall, this study has suggested some patterns and trends of Internet-focused research in the field of health communication:

1. Internet-focused research is highly interdisciplinary. For example, researchers from both communication- and medical-related fields have contributed to this field of research.
2. Published research about the Internet and new communication technologies have increased greatly over sixteen years. For instance, the number of published studies about Internet-focused research increased from 0 in 1997 to 36 in 2012.
3. A range of diverse topics have been investigated, such as health information seeking, online social support, and advancements in health care.
4. A limited number of theories and methodologies have been employed across studies.

The results showed only a small amount of Internet-focused health communication articles used explicit theoretical frameworks.

Internet-focused health communication phenomena have gained attention among researchers from communication- and health-related fields during the sixteen-year time period. The recent five years, specifically, have witnessed a sharp growth of such research. To keep pace with the growing impact of the Internet on individuals' daily lives and increasing research interests, some journals devoted special issues to Internet-focused health communication topics. For example, the Journal of Computer-Mediated Communication had a special theme "Health and the New Media" for an issue in 2001, publishing articles addressing topics such as telemedicine, E-health market, online credibility, and telepsychiatry. Recently, the Journal of Health Communication devoted a special issue to "Web 2.0 and Health Communication" in 2011. This special issue featured major themes reflecting the important role of the Internet on individuals' healthcare including community intelligence [34], the knowledge gap [35], evidence-based medical information [36], and online social support [37]. These special issues discussing the Internet and health communication not only contribute to the overall increase in the number of articles for these time periods, but more importantly, they imply that the Internet is exerting a significant influence on health communication scholarship.

This study has paid particular attention to the interdisciplinary nature of health communication by examining theoretical applications and authors' affiliations. Regarding theoretical applications, two trends were clearly visible. First, among the theories applied to the research sampled in this study, the majority were from communication disciplines, such as Social Cognitive Theory, Uses and Gratification, Third Person Effect, and Knowledge Gap. Only a few health theories were used to direct Internet-focused health communication research. Locker recommended that the first criterion of interdisciplinary research was that such studies should use theories from the relevant outside fields [38]. However, in terms of the interdisciplinary nature of theory uses and application, the health communication field is still in its initial stage.

Second, Internet-focused research in health communication lacked theoretical frameworks. This finding echoes the sentiment of Cho and Khang that only a small portion of the Internet-focused research articles used explicit theoretical frameworks [32], indicating a consistent pattern of minimal theory use in Internet-focused research in general. However, the lack of theory application and development in published studies is not the sole problem of Internet-focused research. Kim et al. and Nazione et al. found that approximately half of the published health communication articles had no theoretical frameworks [11,12], suggesting this pattern was somewhat common in the health communication field. In fact, theory allows for a systematic and scientific examination of a phenomenon and can further explain complex health communication data. New theories and models that specifically explain and predict online health communication

and interaction need to be developed and tested in new contexts. As Thompson suggested, research focusing on theory development should be encouraged in health communication [8].

Finally, this study examined the status of interdisciplinary collaboration by analyzing author affiliation. We find that although the majority of the articles were dependent upon collaborative work, only one tenth of the published studies were conducted based on the collaboration between communication and health scholars. Another sign is that in both communication and health communication journals, scholars from medical- and health-related fields published more articles than researchers from communication-related fields. The patterns in affiliations suggest that in spite of its academic diversity, more researchers from communication-related fields should contribute and participate in health communication research. This interdisciplinary collaboration will allow scholars from various backgrounds the opportunity to share their diverse and interdisciplinary perspectives.

Limitations and implications

This study has limitations. First, it only included a limited number of journals based on their nature and influence factors. Therefore, this research only offers representative findings of Internet-focused research in health communication rather than an exhaustive analysis of the entire population of the field. The interdisciplinary nature of Internet-focused health communication research might be even more evident in a larger sample of journals. In addition, the present study focused primarily on U.S. publications. For future investigation, it would be valuable to include international communication journals as well as public health journals. This would allow a diverse international perspective on this issue.

Overall, the present analysis has several relevant implications. It is among a limited number of studies examining Internet-focused research in health communication scholarship. The findings of this study highlight the need for research in this area due to the unique research trends exposed in the analysis. The present research does not only provide proof of disciplinary performance, but more importantly, assists scholarship by identifying general trends, understanding existing knowledge gaps, and directing future research. Interdisciplinary research efforts, specifically between scholars from communication and health-related fields are strongly encouraged to investigate Internet health communication phenomena. In addition, health communication scholars are encouraged to develop and test theories that specifically deal with new media topics. Future research in this area is encouraged to track further developments in the field and offer insights into the past and future trends, themes, and directions in Internet-focused health communication research.

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