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Factors Affecting Consumer Acceptance of an Online Health Information Portal Among Young Internet Users

Da Tao, PhD, Juan Yuan, BEng, Fenglian Shao, MSc, Debiao Li, PhD, Qi Zhou, BEng, Xingda Qu, PhD

Despite the proliferation of health and nursing informatics applications in the past decade, factors influencing consumer acceptance of the applications are not well understood. This study was conducted to investigate factors affecting acceptance of a consumer-used nursing informatics application (ie, online health information portal) within the framework of the Technology Acceptance Model. A cross-sectional study was conducted in which 201 Chinese young adults were invited to participate in usability testing with a typical health information portal and to complete a self-report questionnaire measuring the model's constructs and five hypothesized variables drawn from consumer and portal characteristics. Hierarchical regression analyses were used to test research hypotheses. Fifteen of the 22 research hypotheses were supported. Perceived ease of use and perceived usefulness predicted satisfaction and behavioral intention, respectively, over and above the portal and consumer characteristics examined in the study. All portal and consumer characteristics had significant, although varied, impacts on the original model constructs. This study demonstrated that an adapted Technology Acceptance Model, extended with portal and consumer characteristics, provides an effective means to understand consumer acceptance of health portals. The findings hold important implications for design and implementation strategies to increase the likelihood of acceptance of consumer-used nursing informatics applications.

KEY WORDS: Nursing informatics, Online health information portals, Technology Acceptance Model, Usability

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The increasing availability and affordability of the Internet have made it one of the most important and convenient sources for the acquisition of health-related information, support, and services.[1] Recent statistics show that a third of adults in the US have looked for health information and services within the past year via the Internet,[2] and half of young French Internet users have used it for health purposes.[3] In this light, the past 2 decades have seen the proliferation of online health information portals (health portals), which specialize in providing varied health and healthcare information and services with the advantages of interactivity, convenience, information tailoring, and anonymity.[4]

Health portals, which can be regarded as one type of nursing informatics application,[5] could meet growing demand for healthcare services and help with nursing practice. First, health portals can help educate consumers with a large body of health information.[6] Second, use of health portals is likely to improve self-care skills through online personalized nursing advisory services, thereby resulting in more suitable medical decision making.[7] Moreover, numerous healthcare tasks (eg, online medical consultation, initial diagnosis of health status) can be performed online, which otherwise can be completed only by face-to-face contact with medical professionals. Therefore, appropriate use of health portals could be particularly useful in helping consumers maintain good physical, psychological, and social well-being in a convenient way and can potentially help relieve burden of nursing work for healthcare system and medical professionals.

Although the benefits of health portals in healthcare and nursing practice have been well documented,[8,9] consumers do not always accept them. It is reported that only 13% of health-information seekers use a specific portal to initiate a search.[2] Not only does nonacceptance mean a loss of return on investment, but consumers will not realize the full benefit of health portals. Thus, lack of user acceptance is a significant concern for both portal providers and consumers. While existing literature focused more on acceptance by medical professionals,[10–13] factors explaining consumer acceptance are underexamined.[14] It is suggested that the lack of examination of contextual variables in model development is also a significant limitation of previous studies, as this leaves

designers and managers without clear guidance in promoting consumer acceptance of health informatics.[13,14]

China, a country with the most Internet users (731 million in 2016),[15] is particularly understudied in terms of health portal use. Young adults are suitable candidates for studies relating to health portal use, especially in online health prevention and promotion programs, as they represent the vast majority of Internet users.[3] In addition, they are more likely than other groups to seek health information and services online.[16] The aim of this study was to identify explanatory variables for consumer acceptance of health portals among Chinese young adults within the framework of a well-established technology acceptance theory (ie, the Technology Acceptance Model [TAM]).[17]

THEORETICAL BACKGROUND AND RESEARCH HYPOTHESES

Technology Acceptance Model

The Technology Acceptance Model is one of the most widely recognized models for research on technology innovation acceptance.[17,18] In TAM, the most proximal antecedent to technology use is behavioral intention (BI), which is now commonly regarded as the agent of acceptance.[18,19] There is another commonly used conceptualization of acceptance, that is, user satisfaction.[20] It is also widely employed as a proxy of acceptance in recent health informatics studies[11,21] and shown to affect BI.[22] The TAM suggests that BI is determined by two beliefs: perceived usefulness (PU) and perceived ease of use (PEOU). Perceived usefulness is defined as the extent to which an individual believes that using a technology will enhance task performance, and PEOU refers to the extent to which an individual believes that using a technology will be free of effort.[17] Thus, the following hypotheses were developed:

H1: satisfaction with health portals would positively affect BI to use the portals,

H2a: PU of health portals would positively affect satisfaction with the portals,

H2b: PU of health portals would positively affect BI to use the portals,

H3a: PEOU of health portals would positively affect satisfaction with the portals,

H3b: PEOU of health portals would positively affect BI to use the portals, and

H3c: PEOU of health portals would positively affect PU of the portals.

While the TAM has been widely validated and extended in various contexts,[13] its application to the modeling of consumer acceptance of health informatics applications has been limited.[19,23,24] There is a concurrent need to gain empirical evidence for the support of such models within health informatics and examine consumer acceptance to facilitate the development and implementation of applications in this arena. In addition, some have argued that the model must be extended with external variables to enhance model explanation and prediction power,[13] especially given the fact that the TAM is not specifically developed for nursing informatics contexts. In fact, the examination of additional explanatory variables drawn from a technology context and end users is a common and widely accepted practice in TAM studies.[13,14,19] After a systematic review of informatics literature,[14] we identified five external variables from portal (ie, usability and perceived credibility [PC]) and consumer characteristics (ie, self-efficacy [SE], health information-seeking preference [HISP], and healthcare knowledge [HK]) that are thought to affect consumer acceptance. In the following sections, we describe the rationale for external variables and develop research hypotheses among them and the TAM constructs.

External Variables

Usability

Usability indicates the extent to which a system interface can be used to achieve specified goals with effectiveness, efficiency, and satisfaction.[25] It can be measured either by an overall scale or by a variety of dimensions. Kim et al[26] identified firmness, convenience, and attractiveness as usability subdimensions and have empirically validated relationships between the subdimensions and online customer satisfaction and loyalty toward the site. Palmer[27] proposed five Web site usability subdimensions (ie, navigability, interactivity, download delay, site content, and responsiveness) and found that all the subdimensions affected Web site success measured by user satisfaction and frequency of site use. Lee and Kozar[28] identified 10 usability constructs for Web site design (ie, consistency, navigability, interactivity, telepresence, learnability, readability, supportability, simplicity, content relevance, and credibility) and found they contributed substantially to the variance of online purchase intention and behavior. Among varied usability dimensions, navigability, consistency, and attractiveness affect user perceptions and performance and therefore were considered as reliable usability dimensions. In summary, there is a large body of evidence on the links between usability dimensions and user satisfaction, intention, and usage behavior. In addition, associations between usability and PEOU/PU have also been documented in studies within and outside health informatics.[29,30] Therefore, we hypothesized that

H4a: usability of health portals would positively affect PEOU of the portals,

H4b: usability of health portals would positively affect PU of the portals,

H4c: usability of health portals would positively affect satisfaction with the portals, and

H4d: usability of health portals would positively affect BI to use the portals.

Perceived Credibility

Perceived credibility refers to the degree to which consumers perceive health information and services to be believable.[31] Information on health portals may not be equally credible because of the ease of publication and the lack of an information verification system. Previous research showed that online users consider credible information more useful, especially for health information.[32,33] People may also feel positive emotion toward health portals if they perceive the content to be credible.[34] Perceived credibility may largely determine the decision to accept a health portal or not. Thus, we hypothesized that

H5a: PC of health portals would positively affect PU of the portals,

H5b: PC of health portals would positively affect satisfaction with the portals, and

H5c: PC of health portals would positively affect BI to use the portals.

Self-efficacy

Adapted from a previous concept of computer SE,[35] SE in this study refers to individual judgment about the ability to use health portals to acquire health information and services. Users consider a technology to be more useful and easy to use when they believe they are capable of using it.[36] A large number of studies in health informatics have demonstrated that SE has a significant impact on TAM constructs.[32,37,38] However, evidence on the link between SE and consumer satisfaction seems lacking[39] and deserves exploration. Thus, we hypothesized that

H6a: SE on health portals would positively affect PEOU of the portals,

H6b: SE on health portals would positively affect PU of the portals,

H6c: SE on health portals would positively affect satisfaction with the portals, and

H6d: SE on health portals would positively affect BI to use the portals.

Health Information-Seeking Preference

Health information-seeking preference refers to the extent to which consumers wish to be informed about health and healthcare.[40] Currently, consumers might prefer to seek health information and services to assist in making healthcare decisions. Health portals increase the accessibility of health information and services compared with traditional approaches such as asking a physician for advice. This suggests that consumers with high HISP would consider health

portals as easy-to-use and useful tools and could be more likely to accept the portals.[40,41] Thus, we hypothesized that

H7a: HISP would positively affect PEOU of the portals,

H7b: HISP would positively affect PU of the portals, and

H7d: HISP would positively affect BI to use the portals.

Healthcare Knowledge

Healthcare knowledge measures the amount of knowledge that consumers feel they have about health conditions and the healthcare process.[40] One of the major reasons for health portal use is to improve their understanding of health status and healthcare options. This suggests that consumers who feel that they have less HK will tend to consider health portals more useful and demonstrate higher rates of acceptance.[19,32] Thus, we hypothesized that

H8a: HK would negatively affect PU of the portals and

H8b: HK would negatively affect BI to use the portals.

METHODS
Participants
A total of 201 participants (aged 18–30 years) were recruited in and around a university campus by poster announcement and network publicity. The mean (SD) age of participants was 21.5 (2.5) years, with comparable numbers of participants across gender. One hundred forty-six participants (72.6%) had attended college, and 53 (26.4%) held a postgraduate degree. On average, the participants spent 5.1 (SD = 2.8) hours on the Internet per day. They usually obtained health information from the Internet (53.2%), families or friends (26.9%), and then medical professionals (19.9%). A small proportion of the sample (16.4%) reported diagnosis of one or more chronic diseases. The study was approved by the institutional review board of Shenzhen University.

Materials and Procedures
The portal tested in this study, 99 Health Portal (Xiamen Wohong Information Technology Co, Xiamen City, Fujian Province, China; www.99.com.cn), is one of the most popular health portals in China.[42] This portal was selected because it provides consumers with a wide range of health information and healthcare services and has appropriate breadth and depth in its structure, making it neither too complex nor too simple for participants to perform healthcare tasks. A usability test was conducted so that participants had an appropriate interaction experience with the health portal. During the usability testing, participants were presented with the portal on a computer and were required to complete several information seeking and healthcare tasks as quickly and successfully as possible. The tasks were designed based on typical healthcare activities that consumers would usually perform with health portals. Examples of the tasks included asking participants to find and identify common symptoms

of certain diseases, to find a drug used for traumatic injury and identify its specific efficacy, to determine whether certain hypothetical blood pressure values were within normal range, to make an appointment with a physician, and to calculate their own body mass index through navigation and use of the portal. Upon task completion, participants were asked to complete a paper-based health portal acceptance questionnaire.

Measures

The acceptance questionnaire was designed after an extensive review of the literature and adapted from validated measurement scales. Behavioral intention was assessed with three items drawn from Venkatesh et al.[18] Satisfaction was assessed using a 4-item scale by Belanche et al.[22] Perceived usefulness and PEOU were assessed using 4-item scales adapted from Davis et al,[17] respectively. Perceived credibility was assessed using a 4-item scale adapted from West.[31] Self-efficacy was assessed by a 3-item scale adapted from previous literature.[36] Health information-seeking preference and health knowledge were assessed based on 4- and 2-item scales, respectively, developed by Wilson and Lankton.[40] Usability was measured with an 8-item scale,[22,28] which provides a total usability score as well as scores for three subdimensions: navigability, consistency, and attractiveness. The three subdimensions were chosen because they were considered likely to affect user perceptions and performance[27,28,30,32] and appropriate in the context of this study. All the questionnaire items were measured using a 7-point Likert scale ranging from "strongly disagree" to "strongly agree." Cronbach's α for all the scales ranged from .75 to .92, indicating that the questionnaire had acceptable reliability.

Data Analysis

Correlation analyses were used to examine the intercorrelations of predictor variables and dependent variables. The hypotheses were tested with hierarchical regression analyses. Two separate hierarchical regression analyses were performed to examine whether consumer (ie, SE, HISP, and HK) and portal characteristics (ie, usability and PC) predicted PEOU and PU, respectively, while adjusted by covariates (ie, gender, age, and time on Internet use). Two other hierarchical regression analyses were performed to examine whether PEOU and PU predicted BI and satisfaction, respectively, over and above consumer and portal characteristics, while adjusted by the covariates. In addition, to specifically examine the role of the three usability subdimensions, the hierarchical regression analyses were rerun with the usability variable replaced by its three subdimensions while keeping all other variables in the regression models the same.

RESULTS

Associations Among Major Variables

Table 1 shows correlations among predictor variables and dependent variables. The major predictor variables were moderately correlated, indicating an acceptable degree of multicollinearity among the predictors.

Hierarchical Regression Analysis Results

Initially, we performed hierarchical regression analyses with the covariates entered in the first step. However, all three covariates were not significantly related to the dependent variables in the full regression models. Therefore, they were not included in the models, which were then retested.

Table 2 presents results of hierarchical regression analyses estimating the effects of predictor variables on PEOU and PU. Health information-seeking preference positively affected PEOU (supporting hypothesis H7a). Self-efficacy significantly affected both PEOU (supporting hypothesis H6a) and PU (supporting hypothesis H6b). Inclusion of portal characteristics made a significant additional contribution to the variance of PEOU ($\Delta R^2 = 0.13$) and PU ($\Delta R^2 = 0.12$). Specifically, usability significantly affected both PEOU (supporting hypothesis H4a) and PU (supporting hypothesis H4b); PC significantly predicted PU (supporting hypothesis H5a). The R^2 change was not significant when PEOU was added to predict PU. Table 2 also shows that the integration of consumer and portal characteristics could explain 43% of the variance in PEOU. The consumer and portal characteristics, and PEOU, accounted for 43% of the variance in PU.

When the overall usability construct was replaced by its three subdimensions, the results showed that navigability significantly predicted PEOU and PU, and consistency significantly predicted PU. The R^2 change became larger when the three usability subdimensions were used to predict PEOU and PU, rather than the overall usability construct. The integration of consumer and portal characteristics could explain 47% of the variance in PEOU. The consumer and portal characteristics, and PEOU, accounted for 45% of the variance in PU.

Table 3 presents results of hierarchical regression analyses estimating the effects of predictor variables on satisfaction and BI. Health knowledge negatively predicted BI (supporting hypothesis H8b). Self-efficacy significantly affected both satisfaction (supporting hypothesis H6c) and BI (supporting hypothesis H6d). Inclusion of portal characteristics made a significant additional contribution to the variance in satisfaction ($\Delta R^2 = 0.25$) and BI ($\Delta R^2 = 0.05$). Specifically, usability significantly affected both satisfaction (supporting hypothesis H4c) and BI (supporting hypothesis H4d), while PC significantly predicted satisfaction (supporting hypothesis H5b). Inclusion of PEOU and PU made a further significant contribution to the variance in

Table 1. Correlations Among Predictor Variables and Dependent Variables

	1	2	3	4	5	6	7	8	9	10	11	12
1. HK												
2. HISP	0.18[a]											
3. SE	0.23[a]	0.29[a]										
4. PC	0.21[a]	0.09	0.51[a]									
5. Usability	0.18[b]	0.19[a]	0.51[a]	0.49[a]								
6. Consistency	0.13	0.18[b]	0.41[a]	0.35[a]	0.68[a]							
7. Attractiveness	−0.01	0.03	0.33[a]	0.35[a]	0.80[a]	0.27[a]						
8. Navigability	0.22[a]	0.18[a]	0.46[a]	0.39[a]	0.75[a]	0.40[a]	0.46[a]					
9. PEOU	0.20[a]	0.33[a]	0.52[a]	0.38[a]	0.55[a]	0.42[a]	0.29[a]	0.59[a]				
10. PU	0.13	0.23[a]	0.54[a]	0.54[a]	0.47[a]	0.24[a]	0.36[a]	0.48[a]	0.42[a]			
11. Satisfaction	0.14[b]	0.17[b]	0.57[a]	0.55[a]	0.68[a]	0.36[a]	0.59[a]	0.61[a]	0.55[a]	0.53[a]		
12. BI	−0.01	0.18[a]	0.48[a]	0.40[a]	0.35[a]	0.10	0.35[a]	0.34[a]	0.38[a]	0.55[a]	0.55[a]	
Mean	3.9	5.8	5.1	4.4	4.9	5.3	4.4	5.1	5.4	5.2	5.1	5.1
SD	1.0	0.8	0.8	0.7	0.7	0.9	1.1	0.8	0.8	0.8	0.7	0.9

[a]$P < .01.$
[b]$P < .05.$

satisfaction ($\Delta R^2 = 0.02$) and BI ($\Delta R^2 = 0.08$). Perceived ease of use significantly predicted satisfaction (supporting hypothesis H3a), while PU significantly predicted BI (supporting hypothesis H2b). The R^2 change ($\Delta R^2 = 0.06$) caused by satisfaction was also significant for BI (supporting hypothesis H1). The integration of consumer and portal characteristics,

Table 2. Hierarchical Regression Results on PEOU and PU

	PEOU		PU		
Variables	**Model 1**	**Model 2**	**Model 1**	**Model 2**	**Model 3**
Use of overall usability dimension in the models					
HK			−0.01	−0.05	−0.05
HISP	0.19[a]	0.18[a]	0.08	0.10	0.09
SE	0.46[b]	0.24[b]	0.52[b]	0.27[b]	0.26[b]
PC				0.31[b]	0.31[b]
Usability		0.43[b]		0.20[a]	0.17[c]
PEOU					0.05
R^2	0.30	0.43	0.30	0.42	0.43
ΔR^2	0.30	0.13	0.30	0.12	0.01
ΔF	42.35[b]	46.58[b]	28.22[b]	20.99[b]	0.53
Use of three usability subdimensions in the models					
HK			−0.01	−0.06	−0.06
HISP	0.19[a]	0.17[a]	0.08	0.10	0.10
SE	0.46[b]	0.20[a]	0.52[b]	0.28[b]	0.27[b]
PC				0.32[b]	0.32[b]
Consistency		0.14[c]		0.11	0.11
Attractiveness		−0.03		0.07	0.07
Navigability		0.39[b]		0.23[a]	0.21[a]
PEOU					0.04
R^2	0.30	0.47	0.30	0.44	0.45
ΔR^2	0.30	0.17	0.30	0.14	0.01
ΔF	42.35[b]	15.38[b]	28.22[b]	13.19[b]	0.37

[a]$P < .01.$
[b]$P < .001.$
[c]$P < .05.$

Table 3. Hierarchical Regression Results on Satisfaction and BI

Variables	Satisfaction			BI			
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3	Model 4
Use of overall usability dimension in the models							
HK				−0.13[a]	−0.16[a]	−0.15[a]	−0.14[a]
HISP				0.06	0.08	0.03	0.03
SE	0.57[b]	0.21[c]	0.14[a]	0.49[b]	0.34[b]	0.22[c]	0.16[a]
PC		0.22[b]	0.18[c]		0.22[c]	0.10	0.03
Usability		0.48[b]	0.40[b]		0.10	−0.02	0.17[a]
PEOU			0.13[a]			0.11	0.05
PU			0.10			0.35[b]	0.32[b]
Satisfaction							0.38[b]
R^2	0.32	0.57	0.59	0.25	0.30	0.38	0.44
ΔR^2	0.32	0.25	0.02	0.25	0.05	0.08	0.06
ΔF	94.77[b]	55.91[b]	4.10[a]	21.76[b]	6.82[c]	12.52[b]	19.98[b]
Use of three usability subdimensions in the models							
HK				−0.13[a]	−0.15[a]	−0.13[a]	−0.13[a]
HISP				0.06	0.10	0.04	0.004
SE	0.57[b]	0.23[b]	0.17[c]	0.49	0.36[b]	0.24[c]	0.19[a]
PC		0.22[b]	0.19[c]		0.22[c]	0.11	0.05
Consistency		0.01	0.03		0.21[c]	0.19[c]	0.18[c]
Attractiveness		0.31[b]	0.32[b]		0.15[a]	0.13[a]	0.03
Navigability		0.27[b]	0.18[c]		0.11	−0.01	−0.07
PEOU			0.18[c]			0.14	0.08
PU			0.07			0.31[b]	0.29[b]
Satisfaction							0.32[b]
R^2	0.32	0.60	0.62	0.25	0.35	0.42	0.45
ΔR^2	0.32	0.28	0.02	0.25	0.10	0.07	0.04
ΔF	94.77[b]	33.61[b]	5.50[c]	21.76[b]	7.49[b]	10.79[b]	13.35[b]

[a]$P < .05$.
[b]$P < .001$.
[c]$P < .01$.

PEOU, and PU could explain 59% of the variance in satisfaction. Consumer and portal characteristics, PEOU, PU, and satisfaction accounted for 44% of the variance in BI.

When the overall usability construct was replaced by its three subdimensions, the results showed that all three subdimensions contributed to the prediction of satisfaction and BI. Specifically, attractiveness and navigability significantly predicted satisfaction, while consistency significantly predicted BI. The R^2 change became larger when we used three usability subdimensions to predict satisfaction and BI, rather than the overall usability construct. The integration of consumer and portal characteristics, PEOU, and PU could explain 62% of the variance in satisfaction. The consumer and portal characteristics, PEOU, PU, and satisfaction accounted for 45% of the variance in BI.

DISCUSSION
Primary Findings
Informatics applications such as health portals are useful to meet consumer demand for health and healthcare information

and services and can be used as supplementary tools in nursing practice to improve efficiency and quality of nursing services, especially among young Internet users. They promise to play important roles in responding to worldwide initiatives toward consumer-driven and patient-centered healthcare and nursing activities.[4] However, before actually delivering on this promise, the applications need to be designed in a way that will be accepted by consumers. Varied context-based variables could influence consumer acceptance but were underinvestigated. In light of this, the present study investigated explanatory variables for consumer acceptance of a health portal within the framework of TAM among young Internet adults. The variables we have examined are important, because implementing health portals and other informatics applications whose design is not an optimal response to consumer characteristics and needs can have a negative impact, resulting in decreased usage of the applications.

What predicts user acceptance and usage behavior on health applications has been a consistent theoretical and practical

challenge in light of the likelihood of technology rejection.[43] A major contribution of this study is that it supports the use of the TAM as an effective theoretical framework to understand predictors of consumer satisfaction and acceptance of health portals. In addition, the present study takes an important step toward extending the model with consumer and portal characteristics and verifies that they were significant predictors of consumer acceptance and satisfaction.

Of the 22 research hypotheses, 15 were supported (Table 4). Several results are consistent with well-established evidence, such as predicting effects of PEOU on satisfaction[21] and predicting effects of PU on BI.[19,40] The results strongly suggest that consumers should be provided with a portal that is easy to use and useful in the search for health information and services. In contrast, our study also provides divergent results, such as nonsignificant effects of PEOU on PU and BI. These results suggest that PU is more important than PEOU when users turn to health portals for healthcare and nursing support. It may imply that nurses should place priority on effective and efficient healthcare services that meet consumer needs in the design and implementation of informatics applications. However, it is also worth noting that the findings

Table 4. Results of Hypothesis Tests

Hypotheses	β[a]	Results
H1: satisfaction → BI	.38[b]	Supported
H2a: PU → satisfaction	.10	Not supported
H2b: PU → BI	.32[b]	Supported
H3a: PEOU → satisfaction	.13[c]	Supported
H3b: PEOU → BI	.05	Not supported
H3c: PEOU → PU	.05	Not supported
H4a: usability → PEOU	.43[b]	Supported
H4b: usability → PU	.17[c]	Supported
H4c: usability → satisfaction	.40[b]	Supported
H4d: usability → BI	.17[c]	Supported
H5a: PC → PU	.31[b]	Supported
H5b: PC → satisfaction	.18[d]	Supported
H5c: PC → BI	.03	Not supported
H6a: SE → PEOU	.24[b]	Supported
H6b: SE → PU	.26[b]	Supported
H6c: SE → satisfaction	.14[c]	Supported
H6d: SE → BI	.16[c]	Supported
H7a: HISP → PEOU	.18[c]	Supported
H7b: HISP → PU	.09	Not supported
H7d: HISP → BI	.03	Not supported
H8a: HK → PU	−.05	Not supported
H8b: HK → BI	−.14[c]	Supported

[a]Path coefficients from the final models of hierarchical regression analyses (with the overall usability construct).
[b]$P < .001$.
[c]$P < .05$.
[d]$P < .01$.

do not necessarily indicate that PEOU does not help explain consumer acceptance, nor is an easy-to-use portal design unimportant. Rather, the findings underscore the importance of mediating effects of PEOU on consumer acceptance, as it contributed substantially to user satisfaction and subsequently influenced portal BI.

Our study identified several characteristics of consumers who tended to accept health portals. This may help to guide the design and implementation of consumer-focused informatics applications and to clarify the prospective use of the applications among specific consumer groups. Consistent with previous studies,[19,40] we found that consumers who prefer to seek health information rather than to receive it from caregivers are less knowledgeable about healthcare, more confident in searching for health information, and more likely to accept and use health portals. Thus, it is likely that consumers will use health portals to improve skills and facilitate medical decision making. Appropriate promotion strategies will be required in the implementation of consumer informatics applications with respect to different types of consumers. It is difficult to envision a single "optimal" health portal that would be able to meet all user requirements.

Findings from our study also suggest a mechanism for examining acceptance of specific characteristics of informatics applications. For example, health portals usually offer a variety of health information and services. Traditionally, portal designers tend toward sophisticated interfaces without considering how to be useful and acceptable to potential consumers. However, many health applications subject to high expectations and large budgets are rejected or underused by the intended audience.[43] Therefore, survey techniques like ours can help reveal consumers' BI to use the applications by examining perceptions regarding TAM constructs and factors related to application characteristics. This may help determine key application characteristics in order to create, maintain, and improve consumer acceptance. Specifically, our study found that PC contributed substantially to the prediction of consumer acceptance. This is in accordance with the worldwide health promotion movement, which recommends that evidence-based health information (usually high in credibility) be provided to online health information seekers.[44] It emphasizes the importance of information credibility in the success of consumer health portals.

In addition, we found that usability, either as an overall construct or represented by multiple subdimensions, was a significant predictor of health portal acceptance and satisfaction. This mirrors the evidence obtained from the study of generic nursing informatics[45] and other patient-specific portals.[30] It suggests that a well-designed portal that is visually appealing, well structured, and easy to navigate is likely to encourage consumer portal BI and satisfaction. Successful portal design can be achieved through human factors design

and usability evaluation.[45,46] Nursing informaticists and portal designers can base design strategies on these findings and on the use of multifaceted usability dimensions, which enable more specific evaluations of health portals. In this study, usability testing evaluated three dimensions (ie, consistency, attractiveness, and navigability) of portal interfaces, all of which were found to be associated with TAM constructs. Given that usability could be represented by many other subdimensions, additional research is also required to understand relationships among those characteristics and TAM constructs in specific nursing informatics scenarios.

Limitations and Future Work

This study has several limitations. First, our data indicated that there was low variability in demographic variables (eg, age and time span of Internet use). This study employed a homogeneous sample. This may have occurred as we recruited participants in and around one university campus, and could have biased our findings. Future studies could include participants from diverse locations to address the limitation. Second, it is difficult to guarantee that the established relationships from a cross-sectional survey in this and previous studies[12,19,24,32,40,47] would remain the same over time. In practice, individuals' perceptions of technology could change.[48] Therefore, longitudinal studies are recommended to examine possible changing roles of predictors in consumer acceptance, which may help with future implementation.

CONCLUSIONS

This study contributes to the understanding of acceptance of consumer-used health informatics applications among young Internet users. We examined several logically related portal and consumer characteristics by testing their associations with well-known TAM constructs. The findings demonstrate that these characteristics function as significant explanatory variables for consumer health portal use and help improve our understanding of which aspects of health portals are accepted and valued by different types of consumers. Future studies could extend the research with a diverse sample and examine the continuance of consumer acceptance for improved design and implementation strategies of health informatics applications.

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