Association between Internet use and decision-making preference in older adults

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M.I. Cajita, E. Whitehouse, C. Budhathoki, N. Hodgson. Association between Internet use and decision-making preference in older adults. Gerontechnology 2016;14(2):97-104; doi:10.4017/gt.2016.14.2.008.00 **Background** Easy access to health-related information on the Internet has the potential to empower patients in making health-related decisions. However, little is known regarding the association between Internet use and decision-making preference in older adults. The aim of the study is to evaluate the association between Internet use and decision-making preference in older adults. **Method** The study analyzed cross-sectional data from 1,945 participants of the National Health and Aging Trends Study. **Results** Older adults who used the Internet had greater odds of active decision-making preference (OR 1.75, 95%CI 1.22-2.52, p=0.002) compared to older adults who did not use the Internet. Similarly, older adults, who searched the Internet for health-related information, had higher odds of active decision-making preference (OR 2.16, 95%CI 1.14-4.09, p=0.019) compared to their counterparts. **Conclusion** Internet use was found to be associated with active decision-making preference in older adults. Similarly, health-related Internet use was positively associated with decision-making involvement in older adults.

Keywords: Internet use, decision-making, older adults

There has been greater emphasis on patient-centered care over the recent decades. The Institute of Medicine (IOM) identified patient centeredness as an essential component of quality health care[1]. Consequently, patient engagement in decision-making is considered a core component of patient-centered care. Given that patients have the most at stake in decisions regarding their health, it is only logical that they should be involved in the decision-making process[2]. Furthermore, patient engagement in decision-making has been associated with increased patient satisfaction and improved health outcomes[3-7].

The accessibility of health-related information via the Internet has the potential to change the dynamics of patient-provider communication. Patients nowadays can readily access information regarding their health conditions online. It is estimated that 43% of the global population, or 3.2 billion people, access the Internet[8]. Subsequently, over 85% of American adults access the Internet[9] and 59% utilize the Internet to search for information on health-related topics[10]. Since the lack of health-related knowledge has been shown to be associated with a more passive approach to decision-making on the part of the patient[11], increased accessed to online health information should empower patients to take a more active role when it comes to making decisions concerning their health.

Passive decision-making is when the patient leaves the decision-making entirely up to the doctor, relying solely on the doctor's clinical expertise; it also referred to as paternalistic decision-making[11]. Informed decision-making involves the doctor fully informing the patient regarding treatment options, their associated benefits and risks, and then allowing the patient to make the decision alone[12]. Shared decision-making is when patient and doctor make the decision together after discussing all aspects of the treatment options (i.e. benefits, risks, costs) while taking into account the patient's values, preference, and outcome expectations[13].

Despite lagging behind their younger counterparts, older adults have been increasingly adopting the Internet over the recent years[9]. In 2012, close to 60% of older adults aged 65 and older were Internet users compared to only 14% back in 2000[9]. Furthermore, about 29% of older Internet users go online to search for health-related information[10]. Despite this shift towards a more Internet-savvy older population, very little is known regarding the association between Internet use and health-related decision-making

preference in older adults. Using a predominantly white, female, and highly educated sample, James et al.[14]yet little is known about the association of internet use with decision making in older persons. We examined this relationship in 661 community-dwelling older persons without dementia from the Rush Memory and Aging Project, an ongoing longitudinal study of aging. Participants were asked to report if they had access to the internet and how frequently they used the internet and email. A 12-item instrument was used to assess financial and healthcare decision making using materials designed to approximate those used in real world settings. Items were summed to yield a total decision making score. Associations were tested via linear regression models adjusted for age, sex, race, education, and a measure of global cognitive function. Secondary models further adjusted for income, depression, loneliness, social networks, social support, chronic medical conditions, instrumental activities of daily living (IADLs found that Internet use was associated with better decision-making ability, and that increased frequency of Internet use attenuated the negative relationship between increased age and decision-making ability. However, whether Internet use influences an older person's decision-making preference still remains unknown.

In this study, we used data from the National Health and Aging Trends Study to examine the association between Internet use and decision-making preference in older people (65 years). We hypothesized that older adults who use the Internet will have greater odds of preferring a more active role in health-related decision-making compared to older adults who do not use the Internet. Subsequently, we will examine the association between health-related Internet use (i.e. searching for health-related information online) and decision-making preference. We hypothesized that older adult who search for health-related information online will have greater odds of preferring an active role in health-related decision-making compared to those who do not.

Furthermore, a review of relevant literature revealed that increased age[14-16] lower social class[11], and religiosity[17] were associated with having an active decision-making style[16,17]. Existing evidence on the association between one's health and one's decision-making preference is inconclusive. Levinson et al.[16] reported that being healthier was associated with an active decision-making style; however, another study found that having poorer health was associated with an active decision-making preference[17]. These identified predictors will be included in the data analysis.

Methods

Sample

This study analyzed data drawn from the first (2011) and second (2012) rounds of data collection of the National Health and Aging Trends Study (NHATS), which is sponsored by the National Institute on Aging (grant number NIA U01AG032947) through a cooperative agreement with the Johns Hopkins Bloomberg School of Public Health[18]. NHATS is a longitudinal study that surveys a nationally representative sample of more than 8,000 Medicare beneficiaries aged 65 and older annually. Detailed information on the NHATS' sample design, sample size, response rates, and survey design is available through the NHATS website[19] .

Briefly, in-person individual interviews were conducted with the study participants by professionally trained interviewers to collect information on the participants' living arrangements, social network, health conditions, activities of daily living, home environment, participation in various activities, cognitive functioning, physical capacity, well-being, and a host of other information relevant to the elderly population. The NHATS sample design was age-stratified. Study participants were sampled from 5-year age groups between the ages of 65 and 90, and from the 90 years and older population. Persons whose race was specified as black on the Center for Medicare and Medicaid Services enrolment file and/or who belonged to the older age groups were oversampled. Furthermore, this study only analyzed data from study participants who were asked what their decision-making preference was (n=2039). Additionally, out of the 2039 study participants, 94 (4.6%) had missing data for some of the study variables (cognition, depression, anxiety, and religiosity); hence, only data from the remaining 1945 study participants were analyzed. Finally, while the current study used data from rounds 1 and 2 of NHATS, no longitudinal data was included. Data on the participants' gender, race, education, income, and ability to speak English were collected from round 1. Data on the participants' age, cognition, social support, comorbidities, depressive symptoms, anxiety symptoms, religiosity, Internet use, and decision-making preference were collected from round 2.

Variables

Decision-making preference was measured using the 1-item variant of the Control Preferences Scale[20,21]. Participants were asked, if they preferred to make decisions: (i) without much advice from their doctor; (ii) get their doctors' advice and then make decisions (informed decision-making); (iii) make decisions together (shared decision-making); or (iv) leave decisions up to their

doctors (passive decision-making). The outcome variable was then coded as a binary variable (0 – passive, option iv; 1 – active, options i-iii).

Internet use was measured using a single item from the Technological Environment instrument ("*In the last month, besides email, have you ever gone on the internet or online for any other reason? Yes/No"*)[22]. Similarly, health-related Internet use was measured using a single item from the same instrument ("*In the last year, have you ever gone on the internet or online to get information about your health conditions? Yes/No"*).

Demographic variables (age, sex, race) were included as covariates in the analyses. Other covariates include: education, income, ability to speak English, cognition, social support, comorbidities, depressive symptom, anxiety symptom, and religiosity. In NHATS, cognition was measured a composite of three cognitive dimensions (memory, orientation, and executive function).

Memory was measured using immediate and delayed word recall tests. First, the study participant was read a list of 10 words and was then asked to recall as many of the words as possible. After a 5-minute delay the study participant was again asked to recall as many words from the list as possible. Scores can range from 0-20 and a score of 3 or less indicated memory impairment.

Orientation was assessed with questions on the date (day, month, year, and whether the study participant looked at a calendar or watch for the date) and the names of the president and vice president of the United States (first and last names). Scores can range from 0-8 and a score of 3 or less indicated impairment in orientation.

Executive function was measured using the clock drawing test. The study participant was given 2 min to draw a clock with the hands set at 10 past 11 (11:10). Scores can range from 0-5 and a score of 1 or less indicated impaired executive function. Sensitivity of the NHATS cognitive tests battery is 65.7% and specificity is 87.2%[23]. Cognition was then coded as a binary variable (no impairment vs. impaired).

Ability to speak English was measured using a single item from the Race, Ethnicity, and Language instrument ("*How well would you say you speak English? Very well/ well/ not well/ not at all"*)[22]. English speaking-ability was then coded as a binary variable (less than very well vs. very well).

Social support was measured using a single item from the Medical Care Activities instrument ("*In the last year, did anyone sit in with you and your doctor during your visits? Yes/No"*)[22].

Depressive symptom was measured using a single item from the Health Conditions instrument ("*In the last month, how often have you felt down, depressed or hopeless? Not at all/several days/ more than half the days/nearly every day"*)[22]. Depressive symptom was then coded as binary variable (never vs. several days to nearly every day).

Anxiety symptom was measured using a single item from the Health Conditions instrument ("*In the last month, how often have you felt nervous, anxious, or on edge*? *Not at all/several days/more than half the days/nearly every day"*)[22]. Anxiety symptom was then coded as binary variable (never vs. several days to nearly every day).

Finally, religiosity was measured using a single item from the Participation instrument ("*In the last month, did you ever attend religious services? Yes/No"*)[22].

Statistical analyses

Data were analyzed using Stata 13 (StataCorp LP, College Station, Texas, USA). Lowess plots of the continuous covariates (age and income) vs. log odds of the outcome variable (decision-making preference) were examined for linearity. If the relationship was roughly linear, the covariate was left unchanged (age); however, if the relationship was not linear, the covariate was recoded as a categorical variable (income). Participant characteristics between those who had an active decision-making preference and those who preferred a passive approach to decision-making were compared using Pearson's χ^2 test and Wilcoxon rank-sum test.

Total effects of Internet use and health-related Internet use were assessed using simple logistic regression. The net effect of Internet use and health-related Internet use on decision-making preference was examined using multiple logistic regression, with age, sex, race, education, income, English speaking ability, cognition, social support, comorbidities, depressive symptom, anxiety symptom, and religiosity as covariates. Additionally, multicollinearity was assessed using variance inflation factors (mean VIF=1.44, range 1.06-2.29).

A three stage hierarchical regression was conducted in order to determine the contributions of Internet use and health-related Internet use in predicting decision-making preference above and beyond those of the covariates. The covariates (age, sex, race, education, income, English-speaking ability, cognition, comorbidity, depres-

sive symptom, anxiety symptom, and religiosity) were entered in stage one. Internet use was entered in stage two and Health-related Internet use in stage three.

Results

Data from a subsample of study participants from the National Health and Aging Trends Study was analyzed for this study (n=1945). Characteristics of the participants included in this study are shown in *Table 1*. The mean age was 78.2 years, 58.6% were female, and 72% were white. The majority of the participants (84.3%) preferred to have a more active role in health-related decision-making (37.6% preferred shared decision-making, 37.5% preferred informed decision-making, and 9.2% preferred to make decisions alone without much help from their doctors). Among the study participants, 37.5% used the Internet and 13.8% searched for health-related information online. Additionally, compared to those who preferred to be actively involved in decision-making, those who preferred a passive approach were more likely to be older, non-white, had a high-school education or less, US$14,464 income, had cognitive impairment, received social support, had comorbidities, and did not attend religious services.

Internet use was associated with higher odds of active decision-making preference (OR 2.81, 95% 2.08-3.78, p<0.001); however, after adjusting for the other covariates, Internet use was no longer significantly associated with decision-making preference (OR 1.42, 95%CI 0.96-2.09, p=0.077). Health-related Internet use was also associated with higher odds of active decision-making preference (OR 4.12, 95%CI 2.33-7.29, p<0.001), even after adjusting for the other covariates (OR 2.16, 95%CI 1.14-4.09, p=0.019). The regression model that included Internet use fits significantly better than the model containing only the covariates (LR 9.61, p=0.002). Finally, the full model (with Internet use and health-related Internet use) fit the best among the three models (LR 6.16, p=0.013, AIC 1611.6). (*Table 2*)

Table 1. Characteristics of the participants taken from the National health and aging trends study (n=1945); Pearson's χ^2 test was used, except when denoted with [a], when Wilcoxon rank-sum test has been executed

Parameter		Sample		Decision-making preference				χ^2	p
		n	%	Active n=1641		Passive n=304			
				n	%	n	%		
Age, Mean±SD		78.1±7.7		77.8±7.6		80.1±8.1		4.65[a]	<0.001[a]
Gender	Male	805	41.4	665	40.5	140	46.0	3.23	0.072
	Female	1140	58.6	976	59.5	164	54.0		
Race	White	1401	72.0	1200	73.1	201	66.1		
	African American	416	21.0	338	20.6	78	25.7	6.30	0.043
	Other	128	7.0	103	6.3	25	8.2		
Education	≥High school diploma	1033	53.1	821	50.0	212	69.7	40.0	<0.001
	≤Some college degree	912	46.9	820	50.0	92	30.3		
Income	≤US$ 14,464	478	24.6	373	22.7	105	34.5		
	US$ 14,465-53,864	975	50.1	826	50.3	149	49.0	25.8	<0.001
	≥US$ 53,865	492	25.3	442	26.9	50	16.5		
Speaks English	Less than very well	129	6.6	102	6.2	27	8.9	2.94	0.086
	Very well	1816	93.4	1539	93.8	277	91.1		
Cognition	No impairment	1571	80.8	1360	82.9	211	69.4	30.0	<0.001
	Impaired	374	19.2	281	17.1	93	30.6		
Social support	No	1198	61.6	1035	63.1	163	53.6	9.69	0.002
	Yes	747	38.4	606	36.9	141	46.4		
Comorbidities	None	175	9.0	160	9.8	15	4.9		
	1-4	1600	82.3	1339	81.6	261	85.9	7.27	0.026
	≥5	170	8.7	142	8.6	28	9.2		
Depressive symptoms	Never	1398	71.9	1191	72.6	207	68.1	2.55	0.110
	Several-nearly every day	547	28.1	450	27.4	97	31.9		
Anxiety symptoms	Never	1289	66.3	1080	65.8	209	68.7	0.99	0.320
	Several-nearly every day	656	33.7	561	34.2	95	31.3		
Religiosity	Did not attend service	790	40.6	646	39.4	144	47.4	6.81	0.009
	Attended service	1155	59.4	995	60.6	160	52.6		
Internet use	Yes	730	37.5	670	40.8	60	19.7	48.67	<0.001
	No	1215	62.5	971	59.2	244	80.3		
Health related Internet use	Yes	268	13.8	255	15.5	13	4.3	27.39	<0.001
	No	1677	86.2	1386	84.5	291	95.7		

Table 2. Result of the hierarchical regression analysis predicting decision-making preference (n=1945); Reference groups: non-Internet users, no health-related Internet use, male, white, high school diploma or less, income ≤$14464, speaks English less than very well, no cognitive impairment, no social support, no comorbidities, no depressive symptoms, no anxiety symptoms, did not attend religious services; OR=Odds Ratio; AIC=Akaike Information Criterion

Predictors		Stage 1		Stage 2		Stage 3	
		OR	p	OR	p	OR	p
Age		0.97	0.005	0.98	0.037	0.98	0.039
Sex		1.47	0.004	1.47	0.004	1.48	0.004
Race	African American	0.81	0.204	0.88	0.433	0.87	0.462
	Other	0.80	0.392	0.80	0.373	0.82	0.427
Education		1.89	<0.001	1.64	0.002	1.62	0.002
Income	US$14,465-53,864	1.23	0.191	1.17	0.303	1.18	0.294
	≥US$53,865	1.34	0.198	1.18	0.478	1.16	0.508
Speaks English		0.96	0.876	0.91	0.698	0.90	0.686
Cognition		0.70	0.026	0.74	0.062	0.75	0.065
Social Support		0.91	0.495	0.93	0.586	0.92	0.555
Comorbidities	1-4	0.50	0.014	0.49	0.012	0.49	0.012
	≥5	0.59	0.142	0.58	0.129	0.57	0.117
Depressive symptoms		0.82	0.207	0.84	0.255	0.84	0.256
Anxiety symptoms		1.32	0.071	1.31	0.081	1.29	0.104
Religiosity		1.28	0.059	1.27	0.067	1.29	0.052
Internet use				1.75	0.002	1.42	0.077
Health-related Internet use						2.16	0.019
Likelihood ratio		94.84		9.61		6.16	
p		<0.001		0.002		0.013	
AIC		1623.4		1615.8		1611.6	

Discussion

In this study, 37.5% of the participants reported having accessed the Internet, which is similar to the 40% cited in a Pew Internet report[10]; however, much lower than the 58.2% reported by James et al.[14]yet little is known about the association of internet use with decision making in older persons. We examined this relationship in 661 community-dwelling older persons without dementia from the Rush Memory and Aging Project, an ongoing longitudinal study of aging. Participants were asked to report if they had access to the internet and how frequently they used the internet and email. A 12-item instrument was used to assess financial and healthcare decision making using materials designed to approximate those used in real world settings. Items were summed to yield a total decision making score. Associations were tested via linear regression models adjusted for age, sex, race, education, and a measure of global cognitive function. Secondary models further adjusted for income, depression, loneliness, social networks, social support, chronic medical conditions, instrumental activities of daily living (IADLs. Furthermore, less than 14% of the participants in this study have used the Internet to search for information relating to their health condition, which is lower than the 29% cited in a Pew Internet report[10]. A possible reason for the discrepancy could be that the sample used in this study was more representative of the general population in terms of gender and race, and was less educated compared to the sample used by James et al.[14]yet little is known about the association of internet use with decision making in older persons. We examined this relationship in 661 community-dwelling older persons without dementia from the Rush Memory and Aging Project, an ongoing longitudinal study of aging. Participants were asked to report if they had access to the internet and how frequently they used the internet and email. A 12-item instrument was used to assess financial and healthcare decision making using materials designed to approximate those used in real world settings. Items were summed to yield a total decision making score. Associations were tested via linear regression models adjusted for age, sex, race, education, and a measure of global cognitive function. Secondary models further adjusted for income, depression, loneliness, social networks, social support, chronic medical conditions, instrumental activities of daily living (IADLs.

Similar to previous studies, a majority of the participants in this study preferred a more active role in health-care decision-making[11,24]. Furthermore, older adults who use the Internet were found to have higher odds of preferring an active role in health-related decision-making compared to older adults who do not use the Internet. Similarly, searching for health-related information online was also shown to be associated with an active decision-making preference.

Previous studies have cited lack of medical knowledge as a reason why older adults prefer to leave the decision-making to their physicians[11,25]. The complexity of medical conditions and their corresponding treatments could be daunting to the layperson, especially among older adults who tend to have multiple comorbid conditions. Hence, patients might find it easier to defer to the healthcare provider's medical knowledge and leave the decision-making up to them. Therefore, the availability of health-related information online and the subsequent knowledge gained from having this information could be a potential reason for the association between Internet use and an active decision-making preference in older adults.

Additionally, Internet use has also been found to be associated with better health-related decision-making ability in older adults[14]yet little is known about the association of internet use with decision making in older persons. We examined this relationship in 661 community-dwelling older persons without dementia from the Rush Memory and Aging Project, an ongoing longitudinal study of aging. Participants were asked to report if they had access to the internet and how frequently they used the internet and email. A 12-item instrument was used to assess financial and healthcare decision making using materials designed to approximate those used in real world settings. Items were summed to yield a total decision making score. Associations were tested via linear regression models adjusted for age, sex, race, education, and a measure of global cognitive function. Secondary models further adjusted for income, depression, loneliness, social networks, social support, chronic medical conditions, instrumental activities of daily living (IADLs. Finally, in an exploratory study that used magnetic resonance imaging, it was found that older adults, who frequently used the Internet, showed greater activation in the regions of their brain that controlled complex reasoning and decision-making during the performance of an Internet search[26]including middle-aged and older adults. As a preliminary means of exploring the possible influence of Internet experience on brain activation patterns, the authors performed functional magnetic resonance imaging (MRI. Despite the significant associations between general- and health-related Internet use and active decision-making preference, caution should be taken in interpreting these results given the cross-sectional design of the study, which precludes causal inferences.

Other predictors of an active decision-making preference were younger age, female gender, higher education, and no comorbidities. Consistent with the findings of a systematic review, younger patients tend to prefer a more active involvement in decision-making compared to their older counterparts[11]. Potential reasons for this trend could be discrepancies in educational attainment, cognitive ability, and health literacy. Similarly, females have been found to prefer a more active role in decision-making in previous studies[11,16,17]. It is posited that females are generally more engaged with their health care; hence, it would follow that they would prefer a more active involvement when it comes to health-related decision-making.

Having more education has also been found to be associated with active decision-making preference in previous studies[16,17]. Given that lack of knowledge has been cited as a barrier to active involvement in decision-making[25]; it only makes sense that people with more education will less likely be passive partners in decision-making. Additionally, previous studies have found that patients who have less severe illnesses or have better health status preferred a more active involvement in health-related decision-making[11].

Limitations

There are limitations to this study. First, as previously mentioned, the cross-sectional observational design of the study only allows for associations and not causality. It is difficult to rule out the alternate hypothesis that older adults who prefer a more active role in decision-making are also more likely to use the Internet. As with any secondary analysis, we were limited to variables that were available in the dataset; hence, precluding the inclusion of other potential confounders such as the participants' personality, motivation, and trust towards their physicians.

Another limitation of the study is the use of single-item, self-report measures for the majority of the study variables. Whilst easier to administer, single-item measures tend to have lower reliability compared to multi-item instruments[27]. Additionally, the self-report measures could potentially introduce inaccuracies brought about by self-enhancement and faulty recall[28].

Despite these limitations, our study offers significant strengths in that it used a fairly large and diverse cohort of older adults, which increases the generalizability of our findings. Consequently, the large sample size also allowed for the adjustment for several variables that could potentially confound the association between Internet use and decision-making preference.

Conclusion

The increasing popularity of the Internet has afforded lay consumers unprecedented access to

health-related information. This increased access to health-related information has important implications for healthcare provider-patient interactions. It has been suggested that the better-informed patients are the more likely they are to be active partners in making decisions regarding their health. The findings from this study support the general argument regarding the association between Internet use and decision-making involvement. However, further research is needed to establish a causal relationship between Internet use and decision-making preference.

Future research would benefit from using more robust measures of Internet use and decision-making preference, such as the Health Information Wants Questionnaire, which measures both decision-making preference and online information preference[29]patient preferences for participation in health care vary greatly. Promoting patient-centered health care requires an understanding of the relationship between Internet use and a broader range of preferences for participation than previously measured. OBJECTIVE: To explore (1. Additionally, future researchers should explore the impact of interventions designed to increase older adults' self-efficacy in searching for health-related information online and eHealth literacy on their decision-making preference and involvement.

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