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Does Annual Health Check-Ups Improve Health Literacy in Minnesotans?

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Abstract

Background: The rising cost of healthcare in America and the increase of health issues necessitate the understanding of strategies to improve the health literacy of American citizens.

Methods: Guided by the Andersen's health behavior model, this study examined the levels of literacy and factors associated with health literacy among adult Minnesotans. Convenience sample of 723 participants was used in this analysis, and multiple regression analysis was utilized to investigate the association of health literacy with Andersen's predisposing, enabling, and need factors.

Results: The findings indicated that enabling factors were educational attainment and annual health checkup and need factors were self-reported health status and Activities of Daily Living (ADLs).

Conclusion: To improve health literacy, future research, policy, and practice should promote community-based health literacy education and practice of annual health check-up where the healthcare professionals may have an opportunity to educate patients about necessary health information and practice.

Keywords: Health Literacy; Education; Health Check-Ups; Health Status; ADLs Difficulties

Introduction

Health literacy refers to the degree to which individuals are capable of acquiring, processing, and understanding the necessary health information and services needed to make appropriate health decisions [1,2], which directly and indirectly influences their range of health outcomes [3,4]. An individual who has an adequate level of health literacy can take charge of one's own health decisions and one's family and community health decisions [5]. Research revealed the surprising relationships between low health literacy and low availabilities of access to health information and services among adults in many developed countries [4]. In the recent decade, health literacy became a more robust concept along with the rapid development of technology and social media in health information communications and services [6]. Therefore, it is crucial to examine and understand the factors associated with health literacy levels among adults in the digital age.

Scientific studies have revealed a wealth of demographic differences in health literacy in the United States (U.S.) [7]. Studies found that lower health literacy was associated with older age, indicating that older adults over 65 years have lower capabilities of understanding health information and services than younger adults in the U.S. [1,7-10]. Moreover, racial and ethnic minority populations were found to have lower health literacy than the White population in the U.S. due to lower socioeconomic status, language barriers, low educational attainment, and employment status [7]. On the whole, adults who were culturally and linguistically diverse were more likely to show lower levels of health literacy in the U.S. [11]. Also, women showed a higher level of health literacy compared to

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their male counterparts in the U.S. [7]. A study, which targeted the Korean immigrant population, indicated that females had higher capabilities in understanding medical forms, instructions on medication bottles, and written information or directions provided by healthcare providers than their male counterparts [12]. Marriage is regarded as a protective factor of a high level of health literacy by encouraging healthy behaviors and social interactions [7]. However, unmarried men were more likely to show higher levels of health literacy than those who were married [12]. Furthermore, health literacy increased with educational attainment in the U.S. [13], indicating health literacy is positively associated with educational level [11,14].

Furthermore, existing studies have shown that health literacy is a critical factor associated with healthcare service utilization [3,15]. One study found that older adults with low health literacy were less likely to use emergency healthcare services among the general Korean population in the United States [15]. Many studies indicated that as for the overall health conditions, health literacy was positively associated with health status in the U.S. [8,13,16-18]. Therefore, health status was a crucial factor in need factors to examine its influence on the level of health literacy among Minnesotan adults. Another potential contributing factor in the level of health literacy is Activities of Daily Living (ADLs) difficulties. A recent study found that participants who reported more ADLs difficulties showed lower levels of health literacy among immigrant populations in the United States [8].

The present study employed Andersen's health behavior model to investigate factors associated with health literacy. Andersen indicated that three significant factors, predisposing, enabling, and need factors impact people's health-related behaviors [19,20] Predisposing factors, which were associated with an individual's needs for health care, included demographic and socio-structural characteristics [8,12,20,21]. Enabling factors were related to alleviate or mitigate access to health care resources [8,15,22,23]. Need factors were identified as individuals' capabilities to recognize their health conditions to make appropriate decisions for health care services [8,12,20,21]. Andersen's health behavior model has been used to explore different perspectives of people's medical care and healthcare service utilization, and more recently, to investigate predictors of health literacy [22,24].

The present study aims to investigate the levels of health literacy and associated factors among adult Minnesotans by using the Andersen health behavior model as a theoretical framework. To our best knowledge, this study is the first attempt to assess the health literacy levels of Minnesotans. The present study was designed to make a significant contribution to the body of knowledge of health literacy among Minnesotans by highlighting how best adults in Minnesota with vulnerable educational and social opportunities can promote their health literacy to ultimately achieve better health conditions.

Methods

The study employed a cross-sectional survey research method. The survey data used in this study was collected from a sample of attendees to the 2016 Minnesota State Fair. With the approval from the University of Minnesota IRB, a booth and a poster with information of the survey were set up at the fair. Attendees who were interested in the study stopped by the booth and those who were aged over 18 years old were eligible to fill out the survey either on an iPad through RED Cap software or a paper version. Participation was voluntary and confidential. Upon completion of the survey, participants received a bag with University of Minnesota logo that is worth about $3.00 as a token of appreciation. The final sample of 723 participants is used in this analysis, including 428 females and 295 males.

Health literacy was the main outcome variable (See Table 2 for descriptive analysis.). It was measured on a 5-point scale (1 = not at all, 5 = always) with seven items from three different sources [5,22,24]. The first three items were asking about participants' confidence to fill out medical forms, problems learning about medical condition because of difficulty understanding written information, frequency of having someone to help with reading hospital materials [5], which focused more on reading and writing health information. The next three items asked about difficulty getting advice or information about health topics, difficulty understanding information from health professionals, and the ability to find information about health from various media (i.e., the Internet, newspapers. magazines, brochures), which were more related to understanding health information from other people and being able to look for health information online [25]. The last item asked about difficulty understanding instructions on a prescription bottle, which focused on understanding health information on prescribed medicine ($\alpha = 0.718$) [26].

In this study, predisposing factors included gender, age group, marital status, and race/ethnicity. Age was self-reported by respondents and analyzed as a continuous variable. Marital status was reported as never married, married or partnered, separated or divorced, and widowed. In the study, never married, separated or divorced, and widowed were grouped in to one variable "other" that was coded as 0, while married or partnered was coded as 1. Participants reported their race/ethnicity as either non-Latino white, non-Latino African American, Hispanic, Native American, or other race/ethnicity. In the study, a dichotomous variable consisting of non-Latino whites and all other as the reference group was analyzed (other=0, non-Latino white=1).

Enabling factors included education level, having annual health check-up, and participating in socializing groups. Although education level was a predisposing factor in ABM, it was considered as financing or organization factor that enable health services utilization in this study [23,25,26]. To measure education level, participants were asked if they graduated

from: elementary school, middle school, high school, some college, college, or graduate school. A dichotomous variable consisting of having a bachelor's degree or not (no=0, yes=1) was analyzed for education level in the study. Regarding the other two enabling factors, respondents were asked do they receive annual health check-ups (no=0, yes=1) and do they attend any socializing group such as a social club or a religious group (no=0, yes=1).

Need factors included self-reported health status and ADLs. Respondents were asked how they would rate their health on a 5-point scale from 1=very poor to 5=excellent or very good. It was analyzed as a dichotomous variable consisting of very poor/poor/fair and good/very good/excellent in the study. ADLs was measured by asking respondents "Are you currently experiencing difficulties in daily life activities" and yes/no was selected (no=0, yes=1).

Univariate and bivariate analyses were employed to examine the demographic characteristics of participants and their health literacy level. Independent-samples T-tests were conducted to compare the reported health literacy mean scores regarding relevant dichotomized demographic characteristics, such as gender, marital status, race/ethnicity, educational level, annual health checkup, participation in a socializing group, self-reported health status, and ADLs difficulties. For age, Pearson correlation was applied to determine whether there was any significant correlation between health literacy and age. In addition, to explore the main research question regarding the predictive factors of health literacy based on Andersen's theoretical framework, a multiple linear regression analysis with a hierarchical model was administrated by entering predisposing, enabling, and need factors in separate blocks. All of the statistical procedures were performed using the SPSS 24.0. Software package.

Results

The socio-demographic characteristics of the sample are shown in Table 1. Slightly more than half of participants were

Table 1: Summary of Socio-demographic Characteristics of the Study Sample (N = 723)

Variables	na (%)	Health Literacy	
		Mean (SD)	p-value[b]
Predisposing Factors			
Gender			
Male	295 (40.8%)	3.83 (0.54)	0
Female	428 (59.2%)	4.00 (0.50)	
Age (Years) (Mean = 41.82, SD=17.03)			0
Marital Status			
Never married or other	329 (45.5%)	3.84 (0.55)	0
Married or partnered	322 (44.5%)	4.03 (0.48)	
Race/ethnicity			
Others	190 (26.3%)	3.84 (0.62)	0.006
Non-Latino white	373 (51.6%)	4.00 (0.48)	
Enabling Factors			
Education			
<Bachelor's degree	219 (30.3%)	3.78 (0.59)	0
≥Bachelor's degree	453 (62.7%)	4.200 (0.47)	
Annual Health Check-up			
No	160 (22.1%)	3.77 (0.50)	0
Yes	522 (72.2%)	3.98 (0.51)	
Participating in a Socializing Group			
No	351 (48.5%)	3.92 (0.73)	0.499
Yes	322 (44.5%)	3.95 (0.64)	
Need Factors			
Self-reported Health Status			
Very poor/poor/fair	119 (16.5%)	3.76 (0.61)	0.001
Good/very good/excellent	550 (76.1%)	3.97 (0.49)	
ADLs difficulties			
No	599 (81.7%)	3.97 (0.49)	0
Yes	84 (11.5%)	1.67 0.66)	

a.The total sample size of each variable may not be the same as the total sample size of the study due to missing values.
b.t-test p-values for binary variables, F-test p-values for categorical variables with more than two values, Pearson correlation for continuous variable.

female, and the average age of the sample was 41.82 (SD = 17.03). Specifically, 29.2% were 18-29 years old. 24.8% were 30-49 years old, and 32.9% were 50 years old or older. Less than half were married or partnered (44.5%). More than half of sample participants were non-Latino whites (51.6%) and had a bachelor's degree or higher (62.7%). Less than half of the participants had attended some socializing groups. More than two thirds of participants had an annual health check-up (72.2%) and most participants reported their health status as good, very good, or excellent (76.1%). Only 11.5% of the sample reported current ADLs difficulties.

Additionally, Table 1 shows the results of bivariate analyses including Independent-samples T-tests and Pearson correlation that examine the association between socio-demographic characteristics and the level of health literacy. Findings indicated all predisposing factors (i.e., gender, age, marital status, and race/ethnicity) are statistically significantly associated with health literacy. Females report a higher level of health literacy than males *(p< 0.001)*. Participants aged 30-49 years old and 50 years or older have the same mean score of health literacy, which is higher than the health literacy mean score of the youngest age group (18-29 years old) *(p< 0.001)*. The health literacy level of participants who are married or partnered is higher compared to those who are not married or other *(p< 0.001)*. The non-Latino white group shows a higher level of health literacy than other race or ethnicity groups *(p< 0.001)*. Furthermore, among enabling factors, education and annual health check-up are significantly related to health literacy. The table reports that participants who obtained at least a bachelor's degree have higher health literacy levels, and the health literacy level of participants who have annual health check-ups is higher than those who have not *(p< 0.001)*. Both need factors, self-reported health status and ADLs difficulties, are significantly correlated with health literacy level. The table reveals a higher health literacy level among participants who reported a good/very good/excellent health status *(p< 0.001)*. Also, those who have ADLs difficulties have lower health literacy levels than participants who did not report any ADLs difficulties *(p< 0.001)* (Table 1).

The status of health literacy of participants is shown by Table 2. Most participants (92.5%) reported that they are "always" to "sometimes" confident when filling out medical forms by themselves. Less than 25 percent of them (22.5%) stated that they "always" to "sometimes" have problems learning about their medical condition because of difficulty understanding written information. Additionally, nearly 20 percent of them (19.9%) reported that they "always" to "sometimes" have someone help them read hospital materials. When asked questions regarding understanding of health information from other people and being able to look for health information online, less than 20 percent of participants reported "always" to "sometimes". With possible scores ranging from 1 to 5,

Table 2: Descriptive Analysis of Health Literacy (N=708[a])

Health Literacy (Chew, CDC, & CHIS) Mean Score (range: 1-5)						
Items	**N (%)**					**Total M (SD)**
	Not at all	**Rarely**	**Sometimes**	**Often**	**Always**	
1. How confident are you filling out medical forms by yourself?	8 (1.1)	12 (1.6)	56 (7.6)	189 (25.8)	433 (59.1)	4.48 (0.79)
2. How often do you have problems learning about your medical condition because of difficulty understanding written information? (REVERSED)	308 (42.0)	217 (29.6)	116 (15.8)	27 (3.7)	22 (3.0)	4.10[b] (1.02)
3. How often do you have someone help you read hospital materials? (REVERSED)	373 (50.90	175 (23.9)	96 (13.1)	35 (4.8)	15 (2.0)	4.23[b] (1.00)
4. How difficult is it for you to get advice or information about health or medical topics if you needed it? (REVERSED)	359 (49.0)	189 (25.8)	109 (14.9)	28 (3.8)	11 (1.5)	4.23[b] (0.94)
5. How difficult is it for you to understand information that doctors, nurses, and other health professionals tell you? (REVERSED)	292 (39.8)	261 (35.6)	111 (15.1)	29 (4.0)	4 (.5)	4.15[b] (0.87)
6. You can find written information about health on the Internet, in newspapers and magazines, and brochures in the doctor's office and clinic. In general, how difficult is it for you to understand written health information?	288 (39.3)	218 (29.7)	92 (12.6)	48 (6.5)	49 (6.7)	2.07 (1.21)
7. When you read instructions on a prescription bottle, would you say it is difficult to understand? (REVERSED)	370 (50.5)	171 (23.3)	101 (13.8)	24 (3.3)	20 (2.7)	1.74[b] (1.00)

a. The total sample sizeis not the same as the total sample size of the study due to missing values.

b. Means after reverse coding.

the mean score of the sample's health literacy level is 4.21 (SD=0.69). (Table 2).

Table 3 shows the multiple regression analysis which investigated the association of health literacy with predisposing, enabling, and need factors among Minnesotans. Based on the F-test and R2, the model fit the data well.

In Model 1 with only predisposing factors, gender and race were significantly linked to health literacy. Females *(B=0.182, p< 0.01)* and non-Latino white participants *(B=0.142, p< 0.05)* appeared to have higher health literacy level.

Model 2 reported associated predisposing and enabling factors with health literacy. After adding enabling factors (education level, annual health check-up, and attending socializing group), race became the only significant predisposing factor *(B=0.142, p< 0.05)*. Of enabling factors, education level and annual health check-up significantly related to health literacy. Compared to groups without a bachelor's degree, groups obtaining a bachelor's degree were associated with a 14.6% increase in health literacy *(B=0.146, p< 0.01)*. In addition, health literacy was likely to be 18.7% higher among participants having annual health check-ups compared to those that do not *(B=0.179, p< 0.01)*.

In Model 3, race as a predisposing factor *(B=0.144, p< 0.01)*, education level *(B=0.121, p< 0.05)* and annual health check-up *(B=0.181, p< 0.01)* as enabling factors maintain significantly associated with health literacy. Additionally, ADLs difficulties significantly predicted health literacy. Health literacy was likely to be 15.1% higher among participants who reported their health status as good/very good/excellent compared to those who reported their health status as very poor/poor/fair *(B=0.151, p< 0.05)*. Additionally, ADLs difficulties as a need factor was found to significantly impact health literacy level. Health literacy among participants who reported having ADLs difficulties was likely to be 21.8% higher than those without ADLs difficulties *(B=0.082, p< 0.01)* (Table 3).

Discussion

The present study aimed to understand the levels of health literacy and factors associated with health literacy among adults in Minnesota by adopting Andersen's health behavior model as a theoretical guide.

The present study provided empirical evidence on a moderate level of overall health literacy among Minnesotans. About half (40.9%) of the participants reported they have difficulties in understanding health-related information. Furthermore, about one-fifth of the participants had difficulty in filling out the medical forms. This finding is supported by prior research [8], which reported that about 23% of participants living in Minnesota also had difficulty in filling out medical forms. Moreover, more than one-fifth of the participants showed they needed assistance in reading medical materials and finding and understanding health-related information on the Internet. Findings suggested that health navigator assistance might be necessary for providing better healthcare services and tailored information in the healthcare system. Notably, findings also indicated that, although it is essential to improve health knowledge among the general population, it is also critical to promote functional literacy which refers to necessary skills needed to effectively navigate the healthcare demands in daily life among the general population [5,8].

Table 3: Multiple Regression Analysis

Variables	Model 1			Model 2			Model 3		
	B	SE	p-value	B	SE	p-value	B	SE	p-value
Predisposing Factors									
Age (Reference: 18—29 years)	0.004	0.002	0.036	0.002	0.002	0.166	0.003	0.002	0.123
Female (Reference: Male)	0.182	0.059	0.002	0.118	0.062	0.055	0.113	0.061	0.063
Married or partnered (Reference: Never married or other)	0.104	0.056	0.1	0.081	0.056	0.146	0.071	0.055	0.198
Race (Reference: Other)	0.142	0.055	0.011	0.142	0.055	0.01	0.144	0.054	0.008
Enabling Factors									
Education (Bachelor's degree or higher) (Reference: < Bachelor's degree)				0.146	0.056	0.009	0.121	0.055	0.029
Annual health checkup (Reference: No annual health checkup)				0.179	0.066	0.007	0.181	0.065	0.005
Attending Socializing group (Reference: No)				0.005	0.051	0.918	0.002	0.051	0.962
Need Factors									
Health status (Good/very good/excellent) (Reference: Very bad/bad/fair)							0.095	0.07	0.18
ADLs difficulties (Reference: No ADLs difficulties)							-0.217	0.082	0.009
Number of observations[a]	385			385			385		
F-test[b]	7.803***			6.498***			6.592***		
R^2	0.076			0.108			0.137		

a. The total sample size is not the same as the total sample size of the study due to missing values.

b. *p<.05; **p<.01; ***p<.001

Hierarchical regression analysis categorized by Andersen's behavioral model yielded that different factors were significantly associated with health literacy among the Minnesotan general population. Two enabling factors (i.e., education attainment and annual check-up) and two need factors (i.e., health status and ADLs difficulties) significantly predicted the level of health literacy. Of enabling factors, education attainment and annual check-up were the most significant factors given the magnitude of coefficient of variables in the regression model, which mirrored the previous studies on health literacy topics, including mental health literacy [8-10,14]. Study participants with higher educational attainment tended to have higher levels of health literacy than those with lower education levels, which is supported by previous studies [1,13,14,27]. In other words, participants with higher education attainment tended to recognize their health issues and access to health-related information and sources. This finding indicated that higher formal education improves the necessary literacy capabilities and skills so that health literacy is improved as well [28]. Moreover, another enabling factor, annual check-up was positively associated with the level of health literacy. Study participants who had an annual check-up showed higher score on the level of health literacy, which is in line with prior research [29]. These findings highlighted the importance of attaining higher education, and annual check-ups among participants might facilitate the ability to acquire and process the level of health literacy adequately [29].

Of need factors in the present study, self-reported health status is significantly associated with the level of health literacy. In accordance with prior research, adults in 33 upper- and middle-income countries reported poor health were associated with the lowest level of health literacy [30]. One possible explanation is that adults in a good health status might pay more attention to maintain their good health so that they are aware of health information and try to improve their abilities to understand health information. Additionally, participants who have more ADLs difficulties presented the lower level of health literacy in the present study, which is supported by previous studies [8,31]. Need factors were independently associated with the level of health literacy, so these may be important to be explored and applied in future studies and interventions [8].

Limitations

The present study is not without limitations. First, our study was a cross-sectional study in Minnesota. Generalization is limited to Minnesota, so caution is needed to interpret the findings. Also, all the variables examined in the present cross-sectional study were not the causal-effect relationships with the level of health literacy. Second, the present study applied three scales to measure participants' health literacy level [5,22,24]. Therefore, this study did not tap into all health literacy domains. Third, this study had more female participants (nearly 60%) than male participants, which limited the scope of gender analysis. Fourth, more than half (51.9%) of the participants in the present study were non-Latino white affecting the generalizability of the results to the whole population in Minnesota. Finally, ADLs were measured by only one item which may not reflect the full dimensions of ADLs.

Implication for future studies and interventions

Despite these limitations, the findings of the present study suggest several critical implications for health literacy practice and policy in Minnesota. The findings related to the educational attainment and annual check-up both presented to be essential factors associated with health literacy in the present study, indicating educational programming in the social context and advocating annual health check-ups.

The findings addressed the importance of examining the state-level health literacy in the general population, as well as highlighted the significance of roles of education attainment associated with health literacy. Enhancing the general health literacy, healthcare providers should collaborate with social workers, school teachers and administrators to bring health information and knowledge into classrooms and school curricula [28]. In addition, health literacy can be improved with life-learning opportunities in which policymakers can establish potential and modifiable policy interventions to reduce the disparities and inequalities in health [30]. This might take more time for healthcare providers to establish innovative ways of demonstrating health-related information, but in the long-run, it might pay off for improving the level of health literacy [9]. Moreover, the present study revealed that annual check-ups showed a positive association with health literacy, which indicated that healthcare providers should encourage patients to maintain routine healthcare. Patients may benefit from the health check-up through communicating with their healthcare providers, especially among those patients with low level of health literacy.

For future studies, it is imperative to consider health literacy with cultural and contextual factors among the general population. It is also crucial to integrate the people's actual cultural understanding of health information and knowledge [8]. The trajectories of health information communication should be more diverse to meet different cultural perspectives and needs, such as oral storytelling, digital narratives, and visual images [8]. Also, healthcare providers should tailor their practices to adopt different levels of health literacy to provide more detailed instruction and education [29]. For example, healthcare providers could use fewer terminologies but more descriptive information to describe the illness and health information when they communicate with patients. Future studies could examine the present findings for causal claims by longitudinal research, which would help develop strategies to highlight and allocate health resources for the

high-risk population without accessing to understanding the necessary health information [8]. The health disparities among Minnesotan adults, including different cultural and ethnic backgrounds, can be improved through more culturally and empirically robust health literacy studies and intervention treatments [8].

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