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Korean and Vietnamese immigrants are not the same: Health literacy, health status, and quality of life

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ABSTRACT

Focused on the health literacy of two subgroups of Asian immigrants, Korean (N = 118) and Vietnamese (N = 105), this study examines the interrelationships among demographics, health literacy, self-perceived health status, and quality of life using structural equation modeling. Findings suggest that, although often labeled as Asian immigrants as an aggregate in the health literature, immigrants from Korea and Vietnam report significant differences in areas of demographics (age, citizenship, time in the US, education, marital status, English proficiency, and health insurance), utilization of health services (mammogram screening, pap smear, colorectal screening, visit to doctors), health literacy, and self-perceived health status, representing their own unique ethnic and immigration status. As hypothesized, for both Korean and Vietnamese immigrants, demographics (especially English proficiency) influence health literacy, which in turn affects self-perceived health status and quality of life. Self-perceived health status also directly affects quality of life. Therefore, health communication and interventions should focus on improving health literacy and alleviating health literacy disparities, which could increase the well-being and QOL among subgroups of Asian immigrants.

KEYWORDS

Korean; Vietnamese; immigrants; English proficiency; health literacy; health status; quality of life

The population of Asian immigrants in the U.S. has been projected to grow from 19.2 million in 2015 to 48.6 million in 2060 (U.S. Census Bureau, 2017). However, it is less likely to utilize evidence-based programs and policies to promote health among this population due to the following reasons (Jung et al., 2017; Kagawa-Singer & Han, 2007). First, Asian immigrants are infrequently represented in public health research. Second, while great heterogeneity exists among Asian subgroups, they are usually homogenized into "Asian," which defies the extreme diversity in national origin, religion, socioeconomic status, language, and other demographic characteristics (Chakkalakal et al., 2018). Third, there is a misconception that Asian immigrants enjoy good overall health and therefore do not warrant health promotion. Fourth, it is difficult to secure population-level data among Asian immigrants (Ghosh, 2003). These reasons make Asian immigrants underrepresented and underserved.

Health literacy is a strong indicator of health status, behaviors, and outcomes in the general population. Little research and understanding exist concerning Asian Americans'

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health literacy and related disparities in health outcomes (Sentell et al., 2011). Therefore, it is important to bridge such knowledge gap and address some of the issues and concerns noted above, unmasking important variations among subgroups in the Asian population. This study thus specifically aims to examine health conditions, the use of preventive health-care services, and the relationship between health literacy and health outcomes among two Asian immigrant groups, Korean and Vietnamese immigrants who experience most cultural, institutional, and linguistic barriers to health-care services in the United States (Kim et al., 2015). There is a pressing need to understand their distinct health-care needs in order to offer culturally tailored intervention programs and services that work (Kim et al., 2015).

Health conditions and use of preventive health-care services

Asian immigrants are the first ethnic group to experience cancer as the leading cause of death since 2000. When disaggregated, cancer was the leading cause of death for Chinese, Korean, and Vietnamese males, and for females of every subgroup except Asian Indians (Chen et al., 2018). Meanwhile, heart disease is the leading cause of death for Asian Indians, Filipino, and Japanese men (Hastings et al., 2015). Although Asian immigrants as an aggregated group are 50% less likely than non-Hispanic Whites to die from heart disease (Centers for Disease Control and Prevention [CDC], 2014b), high blood pressure and stroke are common among every subgroup (Jose et al., 2014). Furthermore, about 9% of Asian immigrants as a whole have Type 2 diabetes, higher than non-Hispanic Whites (7.6%) (CDC, 2014a). Some Asian male subgroups have higher rates (e.g., 15.8% for Filipino and 11.8% for Japanese) than non-Hispanic Black men (8.8%) and male Hispanic immigrants (6.7%) (Nguyen et al., 2015). In addition, mental health issues and suicide rates are also high among Asian immigrants (Leung et al., 2017). For Asian immigrants, depression rate was 7.4% (Kim & Choi, 2010). Suicidal death rate was 1.7%, higher than the 1.3% for non-Hispanic Whites (Anderson & Smith, 2005).

However, Asians do not utilize adequate screening for diseases such as diabetes and blood cholesterol. They are also less likely to receive recommendation for screening than other racial/ethnic groups (Brown et al., 2001; Tung et al., 2016). Asian women have the lowest rates of mammography and pap smears (Kagawa-Singer & Pourat, 2000). Additionally, Asian immigrants are only 25% as likely as Whites, and 50% as likely as African and Hispanic Americans to seek help for mental health services (Asian American Health Initiative [AAHI], 2010).

Health literacy and its correlates

Health literacy, defined as "the degree to which individuals have the capacity to obtain, process and understand basic health information and services needed to make appropriate health decisions" (Institute of Medicine, 2004), may explain some of the health disparities noted above. People with lower health literacy are more likely to have poorer health outcomes, poorer health self-management skills, less screening, poorer medication adherence, higher hospitalization rates, and health-care costs. In contrast, people with higher health literacy are more likely to use preventive care, detect disease early, have long-term care skills to manage chronic diseases, and secure access to suitable health careBerkman et al., 2011; Gonzalez-Chica et al.,

2016). Patients with limited health literacy fail to describe the purpose of the medication prescribed, miss appointments due to not being able to understand or follow directions from health-care providers (Cannon & Boswell, 2009).

In their heuristic health literacy skills framework, Squiers et al. (2012) suggested that health literacy skills are influenced by demographic factors (e.g., age, race/ethnicity, gender, and income), prior knowledge (e.g., experience of illness/disease), resources (e.g., education, employment, language, and social support) as well as mental and physical capabilities (e.g., vision, hearing, cognition). Once exposed to health-related stimulus (e.g., a prescription label), health literacy skills are activated to comprehend the stimulus. Health literacy skills then affect health outcomes directly or indirectly through mediating factors such as health status.

Demographics and resources are related to health literacy strongly and consistently. People with lower education and income, people without health insurance, older individuals, males, ethnic minorities, and immigrants have lower levels of health literacy (Chesser et al., 2016; Furuya et al., 2015; Hadjimina & Furnham, 2017; Kreps & Sparks, 2008; Mantwill & Schulz, 2015; Politi et al., 2014). Lower language proficiency is associated with limited health literacy (Andrulis & Brach, 2007). Kim et al. (2011) indicated that 50% of Asian Americans have limited English proficiency. Chinese, Korean, and Vietnamese immigrants have the lowest level of health literacy among Asian immigrants (Lee et al., 2015).

Based on existing literature, the current study first tests the relationships between demographic, resource factors, and health literacy among Korean and Vietnamese immigrants:

H1: Demographic and resource factors (i.e., age, gender, race/ethnicity, education, income, time in the US, English proficiency, health insurance) are likely to predict the level of health literacy among Korean and Vietnamese immigrants.

Health literacy, health status, and quality of life

Health literacy impacts health outcomes. One direct health outcome is self-perceived health status. Research has demonstrated that self-perceived health status represents a subjective but reliable measure of current health (Szeles, 2018), the objective health indices (e.g., mortality and life expectancy) (Mohan et al., 2011), and well-being (both physical and psychological) (Gilmour, 2012) of different populations.

The positive link between health literacy and health status is well-established (Nutbeam, 2008). Adults with greater health literacy have better self-perceived health status (Bennett et al., 2009). For Asian immigrants as a whole, health literacy was a significant predictor of health status. When disaggregated, the significant association was found for only Chinese and Korean immigrants (Lee et al., 2015).

Health literacy also impacts health outcomes such as quality of life (QOL). QOL is "individuals' perception of their position in life in the physical, emotional, social, mental, spiritual and other areas" (WHOQOL Group, 1995). A few studies have demonstrated the relationship between limited health literacy and poor QOL. For example, Wallace et al. (2008) found that limited health literacy is associated with poorer QOL for a sample of patients who were visiting a university-based family teaching clinic. Panagioti et al. (2018) conducted a prospective cohort study to examine the effect of health literacy on the QOL

among a large number of older patients (N = 4,278) registered in UK general practice. Poor health literacy was found to be associated with lower scores in physical, psychological, social relationships, and environment domains. On the other hand, Wang et al. (2013) demonstrated that the positive relationship between health literacy and QOL was only true for certain Chinese ethnic groups among 913 Chinese women living in a rural area. Thus, relatively few studies have specifically examined the relationship between health literacy and QOL among Asian immigrants in the United States. Health literacy may also influence QOL indirectly through general health status. For example, Szeles (2018) reported that self-perceived health status is a significant predictor of QOL.

To bridge the gap of literature on health literacy and immigrant health outcomes, the following hypotheses test the relationships between health literacy, self-perceived health status, and QOL among Korean and Vietnamese immigrants. Specific types of QOL in this study include physical QOL, emotional QOL, mobility, and bodily pain.

H2: Health literacy is likely to predict self-perceived health status among Korean and Vietnamese immigrants.

H3: Health literacy is likely to predict QOL (i.e., physical QOL, emotional QOL, mobility, bodily pain) among Korean and Vietnamese immigrants.

H4: Perceived health status is likely to mediate the relationship between health literacy and QOL (i.e., physical QOL, emotional QOL, mobility, bodily pain).

Figure 1 presents a synthesized theoretical model, where demographic/resource variables are hypothesized to predict health literacy (H1), which in turn predicts self-perceived health status (H2) and all four aspects of QOL (H3) directly. Perceived health

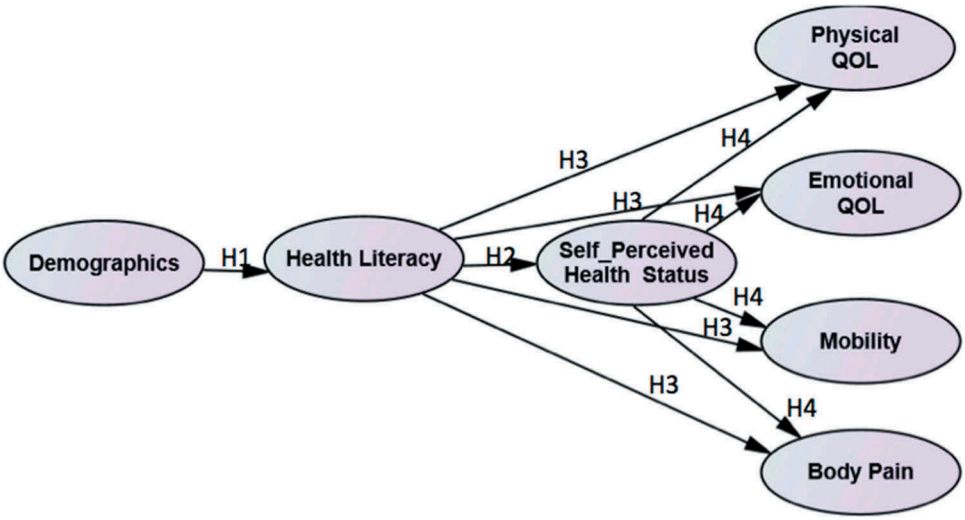

Figure 1. Conceptual model of the relationships between demographics, health literacy, self-perceived health status, and quality of life.

status mediates the relationship between health literacy and the four aspects of QOL (H4).

Method

Participants and sampling

A cross-sectional survey was conducted in the Greater Area of Houston, Texas. Any Asian immigrants who have origins in the Far East, Southeast Asia, and/or the Indian subcontinent, were eligible to participate in the survey if they were 18 years or older, understood English, and had no cognitive impairment. Both first-generation—those who were born outside the United States, and second-generation immigrants—those who were born in the United States but had at least one foreign-born parent, were included. Participants were disaggregated into six subgroups, including Chinese, Japanese, Korean, Filipino, South Asian (SA), and Vietnamese immigrants. Since the study is still ongoing, only Korean (N = 118) and Vietnamese immigrants (N = 105) were available for the current study.

Survey procedure

Participants were recruited from Asian community centers and shopping malls. After clearing IRB on research protocol from the researchers' university, project staff approached potential participants adhering to a script that included project information and eligibility criteria. Interested individuals participated in a short private screening interview to determine eligibility. After reading and giving consent to participate in the study, eligible participants completed the 30–40-minute survey at places of their choices. Each participant received a 5 USD gift card at the completion of the interview as a token of appreciation.

Measures

Demographic/resource factors include age, gender, ethnicity, monthly income, employment, health insurance, education, marital status, time in USA, language spoken at home, and English proficiency (see Table 1).

Health conditions, use of preventive health-care services, and doctor Vvsits. Use of preventive health-care services was measured by asking if participants have ever taken mammography, pap smear, colorectal cancer, and hepatitis screening. Doctor visits were assessed on how many times participants visited their PCP/a medical specialist/an emergency room in the past year. Participants were asked whether they had asthma, diabetes, high blood pressure, and heart disease (health conditions) and to list their major health concerns. Table 2 presents data of these variables.

Self-perceived health status was measured by asking respondents to evaluate their overall health status at the time of the survey (1 = *poor* to 5 = *excellent*) (see Table 2).

Health literacy was adapted from the HLS-EU scale (HLS-EU Consortium, 2012), measuring information understanding (7 items) and information gathering and evaluating (12 items). Sample questions include "How well do you understand information from

Table 1. Demographic characteristics of Korean and Vietnamese participants.

	Korean		Vietnamese		
	M/n	*SD/%*	*M/n*	*SD/%*	Chi-square /*t*-tests
Age	54.9	19.69	49.09	20.26	91.03* (*df* = 66)
Gender					
Female	70	59.3	65	61.9	
Male	44	37.3	32	30.5	
Nationality					21.56***
Not American citizen	56	47.5	19	18.1	
American citizen	60	50.8	84	80	
Time in USA					27.46***
US born	2	1.7	10	9.5	
0–4 years	7	5.9	8	7.6	
5–14 years	46	39	11	10.5	
More than 15 years	62	52.5	75	71.4	
Education					49.33***
Less than high school	11	9.3	18	17.1	
High school graduate	23	19.5	38	36.2	
Finishing undergraduate college	3	2.5	20	19	
Undergraduate college completed	39	33.1	20	19	
More than college	41	34.7	6	5.7	
Marital Status					25.26***
Married	89	75.4	63	60	
Separated	0	0	4	3.8	
Divorced	1	.8	6	5.7	
Widowed	16	13.6	4	3.8	
Single	11	9.3	24	22.9	
Other	0	0	2	1.9	
Employment					1.04
No	62	52.5	46	43.8	
Yes, part-time	19	16.1	19	18.1	
Yes, full-time	34	28.8	33	31.4	
Monthly Income	$2,369.92 (*n* = 96) range (0–16667)	$3091.32	$2,118.62 (*n* = 78) range (0–10000)	$2,415.58	.59
Language					32.66***
No English	64	54.2	18	17.1	
English and others	49	41.5	78	74.3	
English only	3	2.5	6	5.7	
English Proficiency					3.95*
Poor	42	35.6	24	22.9	
Good	74	62.7	77	73.3	
Insurance					11.13*
No	12	10.2	10	9.5	
Yes	103	87.3	92	87.6	

N = Number of respondents; % = Percent; *M* = Mean; *SD* = Standard Deviation.
*$p \leq .05$; **$p \leq .01$; ***$p \leq .001$.

medical prescriptions?" "How well can you find out what to do in case of medical emergency?" (1 = *very difficult* to 4 = *very easy*). The mean scores of these two areas were compared between the two samples (see Table 3). However, the 19 items were included as a whole set in the structural equation modeling (SEM) analysis.

Quality of life (QOL) was adapted from 36-Item Short Form Survey Instrument (SF-36) (Lins & Carvalho, 2016), including areas of physical and emotional health problems, mobility, and bodily pain. Table 3 presents detailed items of these areas (except bodily pain). Higher scores on physical QOL, emotional QOL, and mobility represent higher levels in QOL. Participants were asked to assess how much *bodily pain* they experienced in the past month (1 = *extremely* to 5 = *not at all*).

Table 2. Health status, health conditions, and use of preventive health-care services by Korean and Vietnamese participants.

		Korean			Vietnamese			
		N	%	*M* (*SD*)	*N*	%	*M* (*SD*)	*t*-tests/Chi-square
Health Status[a]		113		2.66 (1.00)	102		3.03 (1.13)	2.58*
Health Conditions								
Asthma	Yes	8	6.8		4	3.8		1.58
	No	78	66.1		85	81		
Diabetes	Yes	24	20.3		16	15.2		1.36
	No	77	65.3		78	74.3		
High blood pressure	Yes	36	30.5		35	33.3		.02
	No	71	60.2		66	62.9		
Heart disease	Yes	8	6.8		11	10.5		.33
	No	81	68.6		84	80		
Use of Preventive Health-care Services								
Mammogram (Female)	Yes	50	71.4		21	32.3		20.89***
	No	15	21.4		40	61.5		
Pap smear (Female)	Yes	40	57.1		22	33.8		15.18***
	No	17	24.3		36	55.4		
Colorectal screening	Yes	44	37.3		20	19		9.91**
	No	64	54.2		77	53.3		
Hepatitis screening	Yes	32	27.1		16	15.2		5.45
	No	69	58.5		77	53.3		

[a]1 = Poor, 2 = Fair, 3 = Good, 4 = Very good, and 5 = Excellent.
N = Number of respondents; % = Percent; *M* = Mean; *SD* = Standard Deviation.
Degrees of freedom in all tests ranged from 213 to 217.
*$p \leq .05$; **$p \leq .01$; ***$p \leq .001$.

Data analysis

A series of *t*-tests and/or Chi-square tests were conducted to examine differences in major variables between Korean and Vietnamese participants. SEM was used to test the hypothesized conceptual model proposed in Figure 1 for the whole sample, Korean immigrant sample, and Vietnamese immigrant sample. All samples reached the minimum number of respondents for conducting SEM—as a rule of thumb, researchers recommend using sample sizes of at least 10 cases per parameter (Kline, 2011). Confirmatory factor analysis (CFA) was first conducted for latent variables to ensure that the proposed factor solutions were adequate. The proposed structural models were then tested. A non-significant Chi-square, the comparative fit index (CFI) >0.90, and the root-mean-square error of approximation (RMSEA) <0.05 suggest a good model fit, but 0.05 < RMSEA < 0.08 is considered acceptable (Byrne, 2016). SPSS 24 and AMOS 24 were used for data analysis.

The proposed CFA models for health literacy, physical QOL, emotional QOL, and mobility had favorable fit indices for the three samples. All factor loadings were greater than .50 for all models. And the Cronbach's alphas ranged from .89 to .97 for all latent variables for the three samples.

The proposed structural model for the *whole* sample produces $\chi^2(1{,}057) = 2{,}679.90$, $p < .001$, CFI = .79, and RMSEA = .08, indicating that the model needs to be improved. Therefore, gender, education, employment, marital status, and income are deleted from the model due to non-significant relationship with health literacy. According to modification indices, error terms between age and English proficiency, between age and length of time in the USA, and among the four aspects of QOL were correlated. The final model yielded χ^2

Table 3. Health literacy skills and physical, emotional, and mobility qualities of life: means, standard deviations, and statistical differences.

	Korean	Vietnamese	
Health Literacy[a]	*M (SD)*	*M (SD)*	*t*
Understanding information	2.77 (.69)	3.18 (.51)	−4.99***
Finding/judging information	2.74 (.68)	3.11 (.51)	−4.63***
Physical Quality of Life[b]			
Cut down of the amount of time you spent on work or other activities	4.08 (1.11)	3.87 (1.18)	1.38
Accomplished less than you would like	3.76 (1.13)	3.88 (1.13)	−.84
Were limited in the kind of work or other activities	4.01 (1.08)	3.77 (1.23)	1.54
Had difficulty performing work or other activities, for example, it took extra effort	3.99 (1.13)	4.09 (1.07)	−.64
Emotional Quality of Life[b]			
Cut down of the amount of time you spent on work or other activities	4.11 (1.11)	4.00 (1.16)	.73
Accomplished less than you would like	3.97 (1.12)	4.04 (1.07)	−.50
Did work or activities less carefully than usual	4.03 (1.10)	4.00 (1.13)	.23
Mobility Quality of Life[c]			
Vigorous activities such as running, lifting heavy objects, participating in strenuous sports	2.06 (.66)	2.22 (.81)	−1.63
Moderate activities such as moving a table, pushing a vacuum cleaner, bowling, or playing golf	2.48 (.70)	2.45 (.72)	.32
Lifting or carrying groceries	2.61 (.62)	2.39 (.76)	2.35*
Climbing several flights of stairs	2.49 (.67)	2.47 (.68)	.17
Climbing one flight of stairs	2.74 (.51)	2.51 (.68)	2.87**
Bending, kneeling, or stooping	2.50 (.69)	2.47 (.68)	.41
Walking more than a mile	2.51 (.72)	2.42 (.75)	.91
Walking several hundred yards	2.55 (.73)	2.48 (.70)	.70
Walking one hundred yards	2.61 (.68)	2.54 (.67)	.75
Bathing or dressing yourself	2.81 (.49)	2.65 (.62)	2.09*

[a]1 = Very difficult, 2 = Fairly difficult, 3 = Fairly easy, and 4 = Very easy.
[b]1 = All of the time, 2 = Most of the time, 3 = Some of the time, 4 = A little of the time, and 5 = None of the time.
[c]1 = Limited a lot, 2 = Limited a little, and 3 = Not at all.
Degrees of freedom in t-tests ranged from 209 to 220. *$p \leq .05$; **$p \leq .01$; ***$p \leq .001$.

(823) = 1,549.25, $p < .001$, CFI = .90, RMSEA = .06, 95% CI [.06, .07], indicating a good fit (Figure 2). Similar procedures were employed for the Korean, $\chi^2(796) = 1{,}572.14$, $p < .001$, CFI = .91, RMSEA = .07, 95% CI [.06, .08] (Figure 3) and Vietnamese, $\chi^2(623) = 947.90$, $p < .001$, CFI = .90, RMSEA = .07, 95% CI [.06, .08] samples (Figure 4).

Results

Sample characteristics

Age of the participants ranged from 19 to 92 years ($M = 52.16$, $SD = 21.13$) with slightly more females ($n = 135$, 60.5%). There were significant differences between the two immigrant groups in some demographic/resource factors (e.g., education, English proficiency; see Table 1).

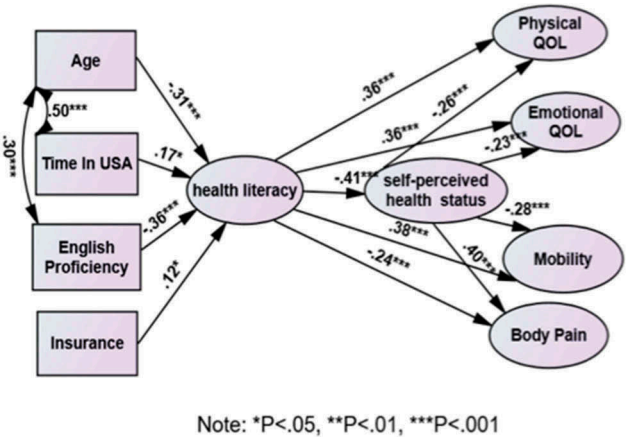

Figure 2. Structural model for the whole sample with significant variables and paths.

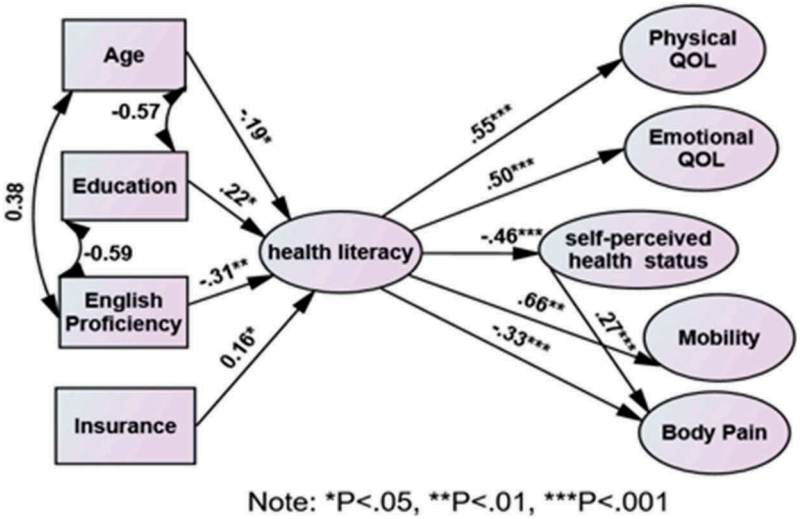

Figure 3. Structural model for the sample of Korean immigrants with significant variables and paths.

Health status, health conditions, and use of preventive health-care services

Significant differences between the Korean and Vietnamese participants emerged in self-perceived health status, $t = 2.58$, $p < .05$, health status compared to last year, $t = 2.21$, $p < .05$, mammography, $\chi^2 = 20.89$, $p < .001$, pap smear, $\chi^2 = 15.18$, $p < .00$, and colorectal screening, $\chi^2 = 9.91$, $p < .01$. Hepatitis screening was reported as a less popular preventive service for both subgroups. High blood pressure was the most often reported health problem among all participants (see Table 2). The Korean immigrants visited doctors in the past 12 months significantly more than the Vietnamese group ($M = 2.80$ vs. $M = 1.61$), $t(201) = 2.07$, $p < .05$.

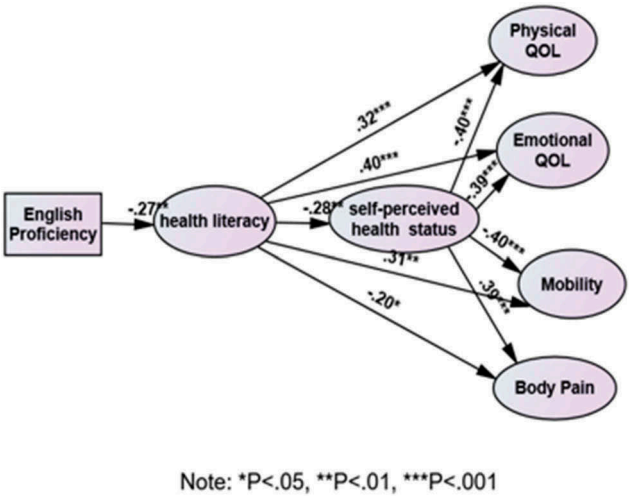

Figure 4. Structural model for the sample of Vietnamese immigrants with significant variables and paths.

Perceived health literacy skills and quality of life

The Korean immigrants were significantly lower than the Vietnamese counterparts in the overall skill of understanding health-related information (M = 2.77 vs. M = 3.18), t *(220)* = −4.99, $p < .001$ and in finding and judging health-related information (M = 2.74 vs. M = 3.11), $t(220) = -4.63$, $p < .001$ (see Table 3).

Participants had high levels of physical, emotional, and mobility QOL (see Table 3). There was no significant group difference in physical and emotional QOL. However, there were significant differences in lifting/carrying groceries, t = 2.35, $p < .05$, climbing one flight of stairs, t = 2.87, $p < .01$, and bathing/dressing, t = 2.09, $p < .05$. Korean immigrants had a marginally significant higher level of bodily pain (M = 3.95) than Vietnamese counterparts (M = 4.20), t = −1.81, $p < .07$.

Predictors of health literacy, health status, and quality of life

Whole sample

Age (β = −.31, SE = .002), length of time in the US (β = .17, SE = .04), English proficiency (β = .36, SE = .08), and health insurance (β = .12, SE = .03) are significant predictors of health literacy. In turn, health literacy is a significant predictor of self-perceived health status (β = .41, SE = .14), physical QOL (β = .36, SE = .06), emotional QOL (β = .36, SE = .15), mobility (β = .38, SE = .07), and bodily pain (β = −.24, SE = .22). Self-perceived health status is also a significant predictor of physical QOL (β = .26, SE = .06), emotional QOL (β = .23, SE = .06), mobility (β = .28, SE = .03), and bodily pain (β = .40, SE = .10).

Figure 2 presents the predictors of health literacy, self-perceived health status, and QOL for the whole sample. Significant demographic/resource variables explain 28.4% variances of health literacy, which explains 16.6% variances of self-perceived health status.

Health literacy and self-perceived health status collectively explain 27.3%, 31.5%, 25.1%, and 29% variances of physical health, mobility, emotional health, and bodily pain, respectively.

Korean immigrant sample

Age (β = –.19, *SE* = .003), education (β = .22, *SE* = .04), English proficiency (β = .31, *SE* = .11), and health insurance (β = .16, *SE* = .03) are significant predictors of health literacy. Health literacy is a significant predictor of self-perceived health status (β = .46, *SE* = .17), physical QOL (β = .55, *SE* = .17), emotional QOL (β = .50, *SE* = .19), mobility (β = .66, *SE* = .09), and bodily pain (β = .33, *SE* = .12). Self-perceived health status is only a significant predictor of bodily pain (β = .27, *SE* = .12).

Vietnamese immigrant sample

English proficiency (β = .27, *SE* = .09) is the only significant predictor of health literacy. Health literacy is a significant predictor of self-perceived health status (β = .28, *SE* = .30), physical QOL (β = .32, *SE* = .26), emotional QOL (β = .40, *SE* = .27), mobility (β = .31, *SE* = .14), and bodily pain (β = .20, *SE* = .43). Self-perceived health status is a significant predictor of physical QOL (β = .40, *SE* = .08), emotional QOL (β = .39, *SE* = .08), mobility (β = .40, S.E = .05), and bodily pain (β = .39, *SE* = .13).

Figures 3 and 4 present the significant predictors and the path parameters for Korean and Vietnamese samples, respectively. For Koreans, significant demographic/resource variables explain 37.8% variances of health literacy. For Vietnamese sample, English proficiency explains 7.5% variances of health literacy. Health literacy accounts for 21.1% and 8.1% variances of self-perceived health status for Koreans and Vietnamese, respectively. Health literacy and self-perceived health status together account for 30.7%, 43.2%, 25.2%, and 27.1% for Koreans and 33.2%, 33.1%, 40.5%, 23.4% for Vietnamese variances of physical health, mobility, emotional health, and bodily pain, respectively.

H1 hypothesizes that demographic and resource factors (i.e., age, gender, race/ethnicity, education, income, time in the US, English proficiency, health insurance) predict the level of health literacy among Korean and Vietnamese immigrants. Given that age, education, English proficiency, and health insurance (but not gender and income) are significant predictors of health literacy for the whole sample and the Korean immigrants sample, and English proficiency is the only significant predictor of health literacy for the Vietnamese sample, H1 is only partially supported.

H2 hypothesizes that health literacy predicts self-perceived health status among Korean and Vietnamese immigrants. H2 is fully supported for all three of the samples. And H3 hypothesizes that health literacy predicts QOL (i.e., physical QOL, emotional QOL, mobility, bodily pain) among Korean and Vietnamese immigrants. H3 is also fully supported for all three of the samples. H4 hypothesizes that perceived health status is likely to mediate the relationship between health literacy and QOL (i.e., physical QOL, emotional QOL, mobility, bodily pain). H4 is fully supported for the whole and Vietnamese immigrant samples, but only partially supported for the Korean immigrant sample.

Discussion

Health conditions and health literacy

High blood pressure, cancer, and diabetes are the most often reported health problems/concerns for both Korean and Vietnamese participants; meanwhile, obesity, stroke, asthma, and mental illness are less frequently reported. These findings are in general consistent with recent reports. According to CDC (2016), between 2011–2014, 25.7% of Asian men and 24.3% of Asian women aged 20 and over had high blood pressure and/or take antihypertensive medication; but fewer Asian men (11.7%) and women (11.9%) were obese. Heron (2017) reported that the top five leading causes of death for Asian/Pacific Islanders in 2015 were cancer, heart diseases, stroke, diabetes, and chronic liver diseases. Nevertheless, stroke, mental health, and chronic liver diseases are serious health problems with little awareness in the two Asian immigrant groups studied. American Heart Association (2018) has analyzed clinical data among 1.77 million Asian American and white patients. Asian immigrants were more likely to experience a severe ischemic stroke and to have a worse outcome compared with white patients. Ischemic stroke accounts for about 87% of all strokes in America.

The findings also suggested that Korean and Vietnamese represent their own unique ethnic and cultural backgrounds. Compared to Vietnamese, Korean participants tend to be new immigrants. They appear to be less acculturated to the U.S. as reflected in the fewer number of USA citizenship, less frequent use of English language, and lower English proficiency (Berry, 2003). On the other hand, despite the language barrier, they tend to have longer education, visit doctors more often, and are more likely to use mammogram screening, pap smear, and colorectal screening.

Although both groups report similar patterns of health problems, Korean immigrants have significantly lower levels of health literacy skills. They find it more difficult to understand information from the pharmacists/the physicians/the media. They also face more challenges when locating or evaluating health-related information, and in case of medical emergency. A possible explanation is that the relatively low level of English proficiency and correspondingly low health literacy skills of Korean participants might have been an obstacle as they process health-related information typically only available in English. Language is one of the most formidable obstacles for Asian immigrants, especially older individuals, to access health-care services in America (Kim & Keefe, 2010). Korean immigrants tend to report the lowest level of English fluency among all Asian immigrants, impeding their access to higher quality health care (Kim et al., 2006). People with limited English proficiency tend to refrain from asking health-related questions (Kim & Keefe, 2010). Although the majority of Korean participants have received at least some college education, they might have received the education in their native language and/or have not stayed in the U.S. long enough to sufficiently comprehend the English language. In contrast, Vietnamese immigrants tend to have lived in the U.S. for a longer period of time, with a large number of them arriving after the Vietnam War in the 1970s.

Predictors of health literacy, health status, and quality of life

For the aggregated whole sample, older Asian immigrants tend to have limited health literacy. However, participants who have stayed longer, can read and write in English

better, and have health insurance tend to have higher levels of health literacy. These findings are consistent with previous studies (e.g., Chesser et al., 2016; Hadjimina & Furnham, 2017; Mantwill & Schulz, 2015), and they suggest that, for Asian immigrants, acculturation level may be significantly related to health literacy. That is, individuals who are more acculturated, indicated by longer residential tenure and a higher level of language proficiency, are more likely to obtain higher levels of health literacy. For the Korean sample, age, education, English proficiency, and health insurance are all significant predictors of health literacy. These findings are consistent with what Lee and Choi (2012) found among Korean immigrants in New York City. However, for the Vietnamese sample, English proficiency is the single significant predictor of health literacy. Such a discrepancy identifies different forms of disparity among the two immigrant groups. The disparity of health literacy across age groups, for example, is only present in Korean but not in Vietnamese community. Insurance status, a general indicator of health access equality, matters more for Korean than Vietnamese immigrants. Thus, it is clear that findings across the aggregated and individual samples are quite different from each other with respect to major "leverages" to work with for possible intervention programs. For Korean and potentially many other Asian immigrants, it is expected that their health literacy will improve as they stay longer in the U.S., acquire greater English proficiency, get more education, and/or have health insurance. Thus, it requires a multi-front approach to improve the health literacy of Korean (and potentially other) immigrants by, for example, offering English language class, creating opportunities for formal education, and assisting with insurance. However, for the Vietnamese immigrants, the results indicate that improving language/English proficiency may be a particularly effective measure, and it needs to be prioritized over other forms of intervention.

As hypothesized, health literacy predicts self-perceived health status for the whole sample, the Korean and the Vietnamese subsamples. The higher their health literacy was, the more likely the participants would perceive their health status is good. This finding is consistent with Bennett et al. (2009).

Health literacy predicts the four components of QOL for the entire sample as well as for both subsamples, which is consistent with Panagioti et al. (2018). When having better health literacy, participants are less likely to encounter negative consequences of physical or emotional problems (e.g., cut down the amount of time on work or non-work activities); participants would also have better mobility (e.g., running, climbing stairs); and they would experience less interference with work from bodily pain.

The current study finds that self-perceived health status predicts the four aspects of QOL for the aggregated sample. For the Vietnamese immigrant sample, self-perceived health status also significantly predicts all four components of QOL. These findings are consistent with Szeles (2018) who states that self-perceived health status is a predictor of QOL as a whole. However, self-perceived health status only predicts bodily pain for the Korean sample. These mixed results indicate that future research should further explore the effect of self-perceived health status on different aspects of QOL among other Asian immigrant groups. Even though findings from the aggregated model indicated that self-perceived health status is an important factor to consider in improving QOL for potentially many Asian immigrants, the individual case of Korean immigrants reveals it is premature to draw such an overall conclusion.

More important, the above findings are consistent to a large extent with the health literacy skills framework proposed by Squiers et al. (2012), who suggest health literacy skills, affected by factors such as demographics and resources, would directly affect health outcomes or indirectly through mediating factors (e.g., health status). Therefore, this study provides empirical evidence to support the theoretical framework. Future research concerning immigrant populations, however, should incorporate language proficiency and acculturation into the framework. This would further advance the research endeavors related to health literacy.

Implications

Asian immigrant populations are underrepresented and underserved in health-care policy and promotion. Additional research will shed light on various relationships proposed and tested in the current study. Interventions should focus on helping Asian immigrants to reduce their cognitive burden placed by the health-care system and their immigration background (e.g., poor English proficiency, low income, lack of health insurance). Further, most of the predictors of health literacy for the Korean sample (i.e., age, education, health insurance) are different from that for the Vietnamese sample (i.e., English proficiency), which necessitates distinct strategies to enhance health literacy in these two different Asian groups. For example, providing English language classes or bilingual medical information may be particularly effective to improve Vietnamese immigrants' health literacy, whereas for Korean immigrants, more expansive strategies beyond language assistance such as creating educational opportunities and offering health insurance support may prove effective.

English proficiency is the only common predictor of health literacy for Korean, Vietnamese, and all participants together. English proficiency is a key factor to health literacy for other Asian immigrant groups as well (Lee et al., 2015; Sentell & Braun, 2012). Thus, English classes or curriculum could be developed for Asian ethnic groups by community-based organizations that serve these groups in order to improve their abilities to read, speak, and understand English. Alternatively, health-related information written in ethnic languages could be expanded.

Health communication programs should promote competence or self-efficacy that empowers Asian immigrants to be autonomous in managing their health. This form of empowerment comes from improved health literacy that enables individuals to motivate themselves and actively engage in making informed health decisions and behaviors (Schulz & Nakamoto, 2013).

Findings of the current study further imply that more "acculturated" individuals (e.g., Vietnamese vs. Korean immigrants)—that is, immigrants who are better assimilated into the host country culture as observed by such proxy measures as language proficiency, length of residence, or certain attitudinal and behavioral orientations (Berry, 2003)—are more health literate. Immigrants with less acculturation experience greater misunderstanding and difficulties in developing meaningful relationships between health-care professionals and others (Locke, 1992). Therefore, when working and communicating with Asian immigrants in clinical settings, health professionals need to take acculturation issues into consideration for greater effectiveness in informed decisions and treatment outcomes. Health promotions for Asian immigrants should also incorporate acculturation

concerns into formative research to ensure understanding of their health literacy skills and develop ethnically competent and understandable educational materials and interventions.

Limitations

A limitation in the current study is the use of HLS-EU scale instead of common instruments of health literacy such as the Rapid Estimate of Adult Literacy in Medicine (REALM) and the Test of Functional Health Literacy in Adults (TOFHLA). The REALM is a recognition/pronunciation test of medical words, a narrow lens to view health literacy with the possibility of (1) correct pronunciation but no understanding of words and (2) incorrect pronunciation but clear understanding. In contrast, the TOFHLA assesses health literacy in a broader way, including reading, numeracy, and document literacy. However, "the TOFLHA numeracy testing items require reading skills, making it quite difficult to disentangle numeracy dimensions from reading" (Nguyen et al., 2017, p. 19). In addition, REALM and TOFHLA would make people feel they are being tested, which "can cause stigma, especially for people who struggle with the test items" (Nguyen et al., 2017, p. 27). Therefore, we used HLS-EU, which is a comprehensive measure of health literacy for general populations, assessing the ability to access, understand, appraise, and apply health-related information (Pelikan & Ganahl, 2017). Further, HLS-EU involves less cognitive effort and less risk for stigma than REALM and TOFHLA (Nguyen et al., 2017). Given that there is no adequate empirical evidence to support the assumption that results from using REALM/TOFHLA and HLS-EU could be interchangeable (Kiechle et al., 2015), findings may differ if other measures of health literacy are used in the study.

The generalizability of the findings is another limitation. First and foremost, findings in the current study may not be generalized to other Asian immigrant groups, given the vast heterogeneity as previously argued. Second, as participants are recruited only at physical venues (e.g., community centers, shopping malls) frequented by Asian Americans, it is unclear how representative the samples are. Therefore, the findings may be generalizable only to the current samples. While it has long been a challenge to recruit minority participants, future work may take advantage of a combination of outreach methods, such as collaborating with community-based organizations; using lay outreach workers, particularly "cultural insiders;" as well as utilizing ethnic social networking sites (Yancey et al., 2006).

Conclusions

There is little societal support for recommending research agendas, creating public health policy, and providing clinical guidelines geared for Asian immigrants. Such predicaments are likely to deepen and perpetuate disparities in health-care policies and investments for them. This study bridges this gap by signifying the importance of health literacy in enhancing health outcomes among Asian immigrants. The findings bring to the fore the fact that health communication and interventions should focus on improving health literacy and alleviating health literacy disparities, which would increase well-being and QOL among Asian immigrants. Furthermore, the findings highlight that there are significant differences across subgroups of Asian Americans, supporting the claim that any

effective health promotions, interventions, and policies should be geared to specific ethnic groups.

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