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Decisional balance and self-efficacy mediate the association among provider advice, health literacy and cervical cancer screening

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1. Introduction

In the 2010 U.S. census, the Asian population was one of the fastest-growing ethnic groups, due in large part to immigration (Humes et al., 2011). In particular, the Korean American population, the fifth largest Asian American group, more than tripled in size between 1980 and 2010 whereas the total U.S. population grew by only 38% during the same period (Ryan, 2013). Given these demographic trends, special consideration should be given to the health concerns of the growing Korean American population.

Cervical cancer is the fourth most common cancer in women worldwide. More than half a million women are diagnosed each year, and approximately 87% of cervical cancer-related deaths occur in developing countries (Ferlay et al., 2015). Although developed countries have implemented effective early detection strategies, cervical cancer incidence and mortality rates remain high among certain racial/minority women in the U.S., which is most often related to a lack of regular screenings (Chawla et al., 2015; Miller et al., 2008; Vesco et al., 2011; Wang et al., 2010). For example, although Hispanic women had the highest incidence of cervical cancer (16.6 per 100,000), the incidence rate for cervical cancer was 11.9 per 100,000 Korean American women (KAW), which is higher than that of their non-Hispanic white and black counterparts (7.9 and 9.9 per 100,000, respectively; Wang et al.,

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2010). In addition, KAW were 1.5 times more likely to die from it than were their non-Hispanic white counterparts (Miller et al., 2008). Regular Papanicolaou (Pap) tests are considered an essential strategy for the early detection and treatment of cervical cancer in a timely manner. National practice guidelines recommend receiving a Pap test at least every three years for average-risk women 21–65 years of age (U.S. Preventive Services Task Force, 2012). Yet only about 70% of KAW have received a triennial Pap test, compared to 89% of non-Hispanic white women and 92% of non-Hispanic black women (Chawla et al., 2015).

Although nearly half of all American adults (90 million) face challenges in health literacy (HL), limited English proficient populations are particularly affected by limited HL (e.g., 75% of KAW; Han et al., 2011). Evidence indicates that low HL is an independent predictor of limited health-related knowledge and self-efficacy, low perceived benefits and high perceived barriers, and inadequate health behaviors, including a lower probability of mammogram screening, colorectal cancer screening, influenza vaccination (Berkman et al., 2011; van der Heide et al., 2015). Berkman et al. (2011) argued that HL explains some disparities in health outcomes, such as self-rated health status and preventive health behaviors. The review also highlights the potential role of HL as a means of overcoming health disparities, such as those in cervical cancer (Berkman et al., 2011).

Despite a growing body of research that has revealed the critical role of HL in Pap test use among English- and Spanish-speaking women (Kim and Han, 2016), only two studies have examined the association between HL and Pap test use among Asian women (Lee et al., 2012; Sentell et al., 2015). HL was a significant correlate of health knowledge and Pap test use among Taiwanese women (Lee et al., 2012); however, the study was conducted in Taiwan, where a national healthcare system has been established and the majority of women use their national language, Mandarin. Based on data from the 2007 California Health Interview Survey, the association between HL and triennial Pap screening was non-significant among Chinese American women (Sentell et al., 2015), but the study looked at HL using only two items: written information at a doctor's office and instructions on a prescription bottle. No theoretical framework was used in the study to justify the selection of the study variables (Sentell et al., 2015). More theory-based systematic research is needed to establish a clear link between HL and Pap test use among limited English proficient Asians in the U.S. von Wagner et al. (2009b) proposed the framework of HL and health actions by integrating the concept of HL and system factors into established constructs from social cognition models of health actions (e.g., knowledge, decisional balance, self-efficacy). Thus, the framework offers a unique and comprehensive way of understanding the pathways through which HL and system factors such as providers' advice influence one's health behaviors, such as Pap test use. Decisional balance – weighing perceived benefits of doing a target behavior (i.e., Pap test use) against perceived barriers that get in the way (Rakowski et al., 1997) is a critical concept to explain the process of adopting a target behavior in relation to HL (Levesque et al., 2006). In addition, self-efficacy – an individuals' ability to exercise control over his or her health habits (Bandura, 1997) has shown to link HL and participation in certain cancer screening behaviors (van der Heide et al., 2015). For example, in the context of colorectal cancer control, researchers have identified plausible indirect pathways between HL and participation in colorectal cancer screening through psychosocial constructs

such as decisional balance and self-efficacy (van der Heide et al., 2015; von Wagner et al., 2009a). Understanding the mechanism linking HL and system factors and Pap test use could provide useful knowledge for the development and modification of interventions. Yet, to the best of our knowledge, no study has investigated indirect pathways that link HL and system factors to Pap test use.

1.1 Purpose of the Study and Hypotheses

The purpose of the present study was to test the HL-focused, sociocognitive framework for KAW's Pap test use (Figure 1). The primary aim of this study was to examine pathways through which HL affects KAW's triennial Pap test use. We investigated the following hypotheses:

- Hypothesis 1–1: HL would be positively associated with triennial Pap test use among KAW.
- Hypothesis 1–2: Cervical cancer knowledge, decisional balance for Pap tests, and cervical cancer self-efficacy would mediate the association between HL and Pap test use.

Namely, that HL would be positively associated with greater cervical cancer knowledge, greater perceived benefits of and fewer perceived barriers to Pap test use, and higher self-efficacy, which would in turn be associated with KAW's Pap test use.

Our secondary aim was to examine the effects of a provider's advice on HL, psychosocial determinants (e.g., cervical cancer knowledge, decisional balance, and self-efficacy) and KAW's Pap test use. The following hypotheses were investigated:

- Hypothesis 2–1: A provider's advice would be positively associated with KAW's Pap test use.
- Hypothesis 2–2: The association between a provider's advice and Pap test use would be mediated by HL and cervical cancer knowledge, decisional balance, and self-efficacy.

2. Methods

2.1. Parent Study

2.1.1. Design—A cluster randomized-controlled trial was designed to test the effectiveness of a community health worker (CHW)-led HL intervention on mammogram and Pap tests among KAW in a northeastern metropolitan area in the U.S.

2.1.2. Subjects and Setting—Details about the parent study design have been published elsewhere (Han et al., 2017). In brief, 29 female CHWs from 23 ethnic churches in the northeastern region of the U.S. were trained to recruit KAW from their respective churches. Eligible KAW were 21 to 65 years of age, able to read and write English or Korean, two years overdue for age-appropriate breast and/or cervical cancer screening, and willing to provide written consent to allow researchers to audit medical records. CHWs also delivered the intervention including HL education, monthly telephone follow-up, and

navigation services for 6 months. A total of 560 eligible KAW completed the survey at baseline. Follow-up data were collected after three and six months. Baseline data were collected between March 2010 and April 2011.

2.1.3. Procedures—Following the identification of potential participants by trained CHWs, trained bilingual research staff provided a brief explanation about the study and verified the eligibility of the women. The staff then obtained written informed consent and administered the study questionnaire. Procedures to assess HL among KAW are reported elsewhere (Han et al., 2014). In brief, the survey was a paper-pencil questionnaire including HL, psychosocial determinants (e.g., breast and cervical cancer knowledge, decisional balance, and self-efficacy) and self-reported mammogram and Pap test use at baseline. Mammogram and Pap test use at 6 months was measured via a medical record review. English survey instruments (e.g., decisional balance, self-efficacy) were translated into Korean and reviewed by a team of bilingual researchers. Any discrepancy was discussed until consensus was reached. In the case of HL scale, while all instructions were written in Korean, all items were written in English (Han et al., 2014) because the previous validation study reported that the Korean-translated version of the Rapid Estimate Adult Literacy in Medicine (REALM) and the Test of Functional Health Literacy in Adults did not capture the concept of HL in KAW whose primary language is phonetic (individuals can pronounce a word as long as they can recognize the Korean alphabet; Han et al., 2011). This violates the logic behind the development of popular literacy tests such as the REALM, which presupposes a high correlation between decoding skills and comprehension (Han et al., 2011). A laminated list of cancer-specific words and a nutrition label were given to assess reading ability and numeracy testing, respectively. Each participant received \$20 for her time. The Institutional Review Board approved all study procedures.

2.2. Current Study

2.2.1. Design—This cross-sectional, correlational study used a secondary analysis of baseline data obtained from 560 KAW in the parent study. The parent study, a large-scale, HL-focused community-based trial on mammograms and Pap tests, presents a unique opportunity for the current study investigating pathways among HL, psychosocial determinants, and Pap test use in the study sample, accounting for system factors.

2.2.2. Framework of Health Literacy and Health Actions—von Wagner et al. (2009b) proposed a framework of HL and health actions. The framework posits that HL is influenced by individual factors such as age and education and external factors such as employment status. In the framework, HL influences the use of healthcare (e.g., Pap test use) through psychosocial determinants such as motivation (knowledge, beliefs) and volition (self-efficacy). von Wagner et al. (2009b) posited that the psychosocial determinants are influenced by system factors such as the accessibility of health information and/or patient–provider communication. In addition to potential attributes of HL described in the framework, other research literature suggests that patient–provider communication such as a provider’s brief advice and a nurse-led counseling program could improve an individual’s HL (Taggart et al., 2012). Moreover, in the context of cancer control, system factors such as insurance and a provider’s advice on Pap tests directly influence KAW’s Pap test use (Lee et

al., 2011). Taken together, the findings suggest that a provider's advice on Pap tests could be a confounder of pathways of HL to Pap test use, unlike von Wagner et al.'s (2009b) framework proposing that system factors affect only psychosocial determinants. As shown in Figure 1, our revised framework includes known covariates of HL (i.e., age, education, English proficiency), a confounder of the relationship between HL and Pap test use (i.e., a provider's advice), and a known covariate of Pap test use such as health insurance.

2.2.3. Measures—The following sample characteristics were associated with the current study: age, education, income, marital status, English proficiency, length of stay (in years) in the U.S., and insurance status, and a provider's advice about Pap test use. A provider's advice was measured using the question, "Has your primary care provider recommended Pap test use within the last 2 years?" Income was assessed from their "income comfortability," measured on a 5-point Likert scale (1=*very comfortable* to 5=*very uncomfortable*). English proficiency was measured through self-reported spoken English proficiency on a 4-point Likert scale (1=*not at all* to 4=*fluent*). Length of stay (in years) in the U.S. was self-reported. The primary outcome (triennial Pap tests) was determined by deducing individual's self-reported most recent Pap test use at baseline from the month and year of the baseline data collected. The following measures were associated with the current study.

2.2.3.1. Assessment of Health Literacy in Cancer Screening: The Assessment of Health Literacy in Cancer Screening is a cancer screening-specific HL instrument that was developed based on Baker's conceptualization of HL (Baker, 2006). This scale consists of 52 items representing five subscales (Han et al., 2014): (1) comprehension (individuals relate a cancer-specific term to a picture or a word of the meaning; 12 items), (2) familiarity (individuals' degree of familiarity with the cancer-specific term; 12 items), (3) reading ability (individuals decode a cancer-specific term; 12 items), (4) navigational literacy (individuals' ability to navigate the trajectories required for cancer screening, such as checking in during a gynecological visit and making an appointment for mammogram; 12 items), and (5) numeracy (individuals' arithmetic ability relative to a nutrition label; 4 items). Except for the familiarity subscale, participants' responses were coded as correct or incorrect. The familiarity subscale was originally assessed on a 5-point Likert scale (0=*not at all familiar* to 4=*very familiar*) and recalibrated on a 0–1 scale to make possible scores ranging from 0 to 12. The total possible scores ranged from 0 to 52. The Assessment of Health Literacy in Cancer Screening was validated among KAW, with an alpha coefficient of 0.70–0.92 (Han et al., 2014). In Han et al.'s (2014) study, the construct validity of the scale was assessed by testing the correlation with known variables, such as age and education ($r=0.11$ to 0.62). The scale had strong concurrent validity ($r=0.87$) with the REALM (Han et al., 2014).

2.2.3.2. Cervical Cancer Knowledge: The Cervical Cancer Knowledge test includes 10 items validated with Korean women, with internal consistency coefficients ranging from 0.80 to 0.89 (Park et al., 2005). Additional 10 items associated with the prevention of human papillomavirus (HPV) infection and the impact of persistent HPV infection were added to the original Cervical Cancer Knowledge test (Allen et al., 2009; Park et al., 2005), resulting

in 20 items total being included on the test. The modified scale yielded an internal consistency reliability of 0.85 in the study sample.

2.2.3.3. Decisional Balance: Decisional balance (i.e., weighing the pros and cons to adopt a target behavior) was assessed by asking participants about the perceived pros and cons of Pap tests (Rakowski et al., 1997). This scale consists of five pros (e.g., “A Pap test finds cancer at a point when it is more likely to be cured.”) and nine cons (e.g., “I worry that if I have a Pap test, I will need an operation.”) of Pap test use measured on a 5-point Likert scale (1=*strongly disagree* to 5=*strongly agree*). The nine con items were reverse-coded. The decisional balance measure was validated in Chinese American women, with Cronbach’s alphas ranging from 0.76 to 0.86 (Strong and Liang, 2009). The Cronbach alpha for the Korean version of the decisional balance measure was 0.84 in this sample.

2.2.3.4. Cervical Cancer Self-Efficacy Scale: The Korean-translated Cervical Cancer Self-Efficacy scale was used to measure how confident a woman was in carrying out each task in relation to Pap tests. The Cervical Cancer Self-Efficacy scale consists of four items on a 4-point Likert scale (Hogenmiller et al., 2007) that were validated among Mexican American women, with a Cronbach’s alpha of 0.95 (Fernandez et al., 2009). The reliability of the Korean version of this scale had an internal consistency reliability coefficient of 0.92 in the study sample.

2.2.4. Statistical Analysis—Descriptive statistics were performed using Stata 13. Descriptive statistics were used to summarize means and standard deviations (SDs) for continuous variables and tabulate a frequency and percentage for each of the categorical variables. Sociodemographic variables were categorized as follows: age: (1) <40 years and (2) 40 years; education: (1) up to graduation from high school and (2) at least some college education; income: (1) very comfortable/comfortable and (2) neutral/uncomfortable/very uncomfortable; marital status: (1) married/partnered and (2) separated/divorced/widowed/never married; English proficiency: (1) not at all, poor, fair and (2) fluent; length of stay in the U.S.: (1) women who had spent more than 25% of their lifetime in the U.S. and (2) those who had not. Health insurance was categorized in two groups: (1) uninsured and (2) private, Medicare and Medicaid, or other, such as traveler’s insurance and student insurance.

We used structural equation modeling (SEM) to evaluate the fitness of the HL-focused sociocognitive framework for KAW’s Pap test use in explaining the pathways through which HL influences KAW’s Pap test use. The SEM analysis was performed in two steps: measurement model testing and structural model testing (Anderson and Gerbing, 1988). In the first step, we constructed a latent variable of HL by using five subscales of the Assessment of Health Literacy in Cancer Screening as indicators (Table 1). The confirmatory factor analysis revealed a generally acceptable measurement model fit (comparative fit index [CFI]=0.991, the root mean square error of approximation [RMSEA]=0.087 [90% CI: 0.056 to 0.121], the Tucker-Lewis index [TLI]=0.981, and $\chi^2/df=26/5$), indicating that we could proceed to the next step (Hu and Bentler, 1999).

In the second step, we evaluated the HL framework for KAW’s Pap test use through the examination of structural model fit and standardized path coefficients. In order to test the

indirect pathway hypothesis, two structural models were created and compared. Specifically, Model 1 (a full model) examined the coexistence of a direct effect of HL on Pap test use and an indirect effect of HL on Pap tests through psychosocial determinants. Model 2 (a nested model) tested only the indirect effect. As suggested in the HL framework, we included the provider's advice in these two models, in addition to other covariates of HL and Pap test use. The final model was selected based on the log-likelihood values of chi-square difference testing to compare the nested model relative to the comparison model. If the chi-square difference p-value is greater than 0.05, it indicates that the additional path (i.e., a direct path between HL and Pap test use in the full model) worsens the model fit; thus, we would choose the nested model. Using the final model, we then assessed the effects of a provider's advice on HL, psychosocial determinants and Pap test use to test our secondary aim.

SEM fitting and testing were performed using Mplus version 7 via robust weighted least squares (WLSMV) estimation at a significance level of 0.05. Probit regressions were estimated. The final dependent variable (Pap test use) was dichotomous; thus, bias-corrected bootstrapping (5,000 samples) was used to obtain standard errors and confidence intervals for indirect effects, which helped determine the significance for the mediation pathways (Hayes, 2009). If 95% asymmetric confidential intervals of the bootstrap estimates did not include zero, the path was considered significant (Mackinnon et al., 2004). Model goodness of fit was assessed using several indices; specifically, the CFI >0.95, the RMSEA close to 0.06, and the TLI >0.95 were indicative of an acceptably fitting model (Hu and Bentler, 1999). A relative chi-square test (χ^2/df) was also used, with an acceptable ratio ranging from 2.0 to 5.0 (Wheaton et al., 1977).

3. Results

3.1. Sample Characteristics

A supplementary table summarizes sample characteristics. All women were born in Korea. A majority of women were middle-aged (mean age $\pm$ SD=46.1 $\pm$ 8.5 years), and had at least some college education (64.8%, mean years of education $\pm$ SD=14.5 $\pm$ 2.7). About 70% had lived in the U.S. for 10 years or more (mean length of stay $\pm$ SD=16.5 $\pm$ 9.7 years), ranging from 1 month to 62.3 years. About 59% had lived in the U.S. for more than one-fourth of their lives. Less than one-third (26.4%) felt very comfortable or comfortable regarding their income level. Only 23.4% reported English fluency. Only 37.9% had health insurance. Only 15.7% reported receiving a provider's advice regarding a Pap test within two years. About 25% reported receiving a triennial Pap test.

3.2. Evaluating the HL-Focused, Sociocognitive Framework for KAW's Pap Test Use

3.2.1. Evaluating Two Competing Mediation Models—Table 2 describes the goodness of fit indices. Model 1 tested the direct and indirect effects of HL on triennial Pap test use through cervical cancer knowledge, decisional balance for Pap tests, and cervical cancer self-efficacy. This model yielded the following goodness-of-fit indices: CFI=0.927, RMSEA=0.052, 90%CI (0.043, 0.062), TLI=0.902, and χ^2/df =170/67. Although all other pathways were significant ($p<0.05$), the direct pathway between HL and Pap test use was not significant (path coefficient=0.032; $p=0.569$).

In Model 2 we removed the direct pathway between HL and Pap test use from Model 1 and tested an indirect relationship between HL and Pap test use through the selected mediators. Path coefficients are given in Figure 2. The model resulted in similar goodness-of-fit indices with the data: CFI=0.934, RMSEA=0.055, 90% CI (0.045, 0.065), TLI=0.909, and $\chi^2/df=158/59$. However, Model 2 containing only an indirect pathway between HL and Pap test use was retained based on chi-square difference testing ($\chi^2=0.325$, $df=1$, $p=0.569$). The indirect effect of HL on Pap test use was small, but significant, with a standardized path coefficient of 0.125 ($p<0.001$). Decisional balance was the strongest mediator between HL and Pap test use, followed by self-efficacy (standardized path coefficients: 0.043 and 0.037, respectively). Table 3 summarizes the path coefficients for indirect pathways.

3.2.2. Assessing the Effects of a Provider's Advice on HL, Mediators and Pap Test Use—As shown in Figure 2, a provider's advice had the direct effect on cervical cancer knowledge, decisional balance for Pap test and self-efficacy, and Pap test use. In addition, the provider's advice was positively associated with HL, which was in turn associated with cervical cancer knowledge, decisional balance for Pap tests, and self-efficacy that subsequently predict KAW's Pap test use. A provider's advice had the strongest direct effect on Pap test use, with a standardized coefficient of 1.058 ($p<0.001$). As shown in Table 4, the indirect effect of provider advice on Pap test use was about twice the effect of HL on Pap test use (standardized path coefficients: 0.233 and 0.125, respectively). Decisional balance was the strongest mediator between provider's advice and Pap test use, followed by self-efficacy (standardized path coefficients: 0.080 and 0.073, respectively).

4. Discussion and Conclusion

4.1. Discussion

Our hypotheses were supported by our findings, although cervical cancer knowledge was not a mediator in the pathways from a provider's advice and HL to KAW's Pap test use as hypothesized in primary and secondary hypotheses. We found that HL indirectly, rather than directly, affects KAW's Pap test use through theoretically driven mediators such as decisional balance and self-efficacy. In addition to a direct effect on Pap test use, receipt of a provider's advice was positively associated with HL and psychosocial mediators, which in turn predict KAW's Pap test use. To the best of our knowledge, this is one of the first studies to investigate potential pathways between HL and Pap test use in a high-risk group of Asian immigrant women using a validated cancer-specific and comprehensive HL measure, accounting for provider's advice. Using a latent variable model within SEM, we were able to incorporate multiple subdomains of HL (familiarity, comprehension, reading ability, navigation, and numeracy) and theoretically based psychosocial determinants of Pap tests (cervical cancer knowledge, decisional balance, and self-efficacy) into one model; this approach improved the construct estimation and control for measurement errors (Bollen, 1989).

A provider's advice had both direct and indirect effects on Pap test use. Our finding is consistent with the results of studies in which a provider's advice predicted Pap test use among KAW (Lee et al., 2011). Yet, in this study, 84% of the total sample reported not

receiving a provider's advice regarding Pap tests. In addition, more than one in four Korean women in the study who had received a provider's advice ended up not getting a Pap test. Future cancer screening programs should not only target providers to increase advice, but also investigate what the process of patient-provider communication looks like and how this process affects a woman's decision to receive Pap tests or not in relation to her cultural values and preferences. This study sheds light on effective communication by demonstrating that targeting decisional balance toward positive change and increasing self-efficacy can be the most effective in promoting Pap test use. Nonetheless, in a review, patients with limited HL tended to encounter particular difficulties in understanding the information shared by their providers in reference to cancer screening and, consequently, experienced a late diagnosis of cancer (Davis et al., 2002). Our findings filled gaps regarding how HL affected Pap tests through knowledge and highlighted the need for interventions targeting changes in beliefs and self-efficacy as well as an increase in cervical cancer knowledge.

Our study clearly delineated a pathway through which HL influences Pap test use among KAW: Having greater HL contributed to having greater cervical cancer knowledge, greater decisional balance (more perceived benefits of and fewer perceived barriers to Pap test use), and higher self-efficacy regarding Pap test use. Our lack of findings in the mediation of cancer knowledge between HL and Pap test screening is consistent with the results reported by Lee et al. (2012) who studied Taiwanese women and their Pap testing behavior. In this Korean sample, we further learned that cancer knowledge interplayed with decisional balance in relation to Pap tests: High cervical cancer knowledge was associated with higher decisional balance, which was then linked to Pap test use. To a large extent, our findings are congruent with the available evidence supporting an indirect effect of HL on health behaviors, such as diabetic self-care (Lee et al., 2016) and asthma self-care (Wang et al., 2014). For example, the association between HL and diabetes self-care was mediated by diabetes-related self-efficacy (Lee et al., 2016). Other psychosocial determinants, such as perceived capacity to communicate with their healthcare providers, diabetes fatalism – defined as “a complex psychological cycle characterized by perceptions of despair, hopelessness, and powerlessness” (Egede & Ellis, 2010), and social support, were also noted as mediators (Leung et al., 2014). In the context of cancer control, we identified only one study in which psychosocial determinants were investigated: Miles et al. (2011) noted that lower cancer fatalism – defined as “the belief that death is inevitable when cancer is present” (Powe, 1995), was a mediator of the relationship between HL and participation in colorectal cancer screening. Further investigation of theoretically grounded, culturally specific psychosocial mediators for diverse cancer screening behaviors among culturally and linguistically diverse populations is warranted.

To comprehensively understand and capture the concept of HL, the National Academy of Medicine endorses the importance of considering HL demands and complexities in the context/system, in addition to individuals' skills and abilities, as evidenced in the report titled “Considerations for a New Definition of Health Literacy” (Pleasant et al., 2016). As our first step in this regard, we used a multidimensional, cancer screening-specific HL tool to capture individuals' HL in the context of cancer screening. We believe that successfully revealing the underlying pathways between HL and Pap test use may have been a result of our use of the multidimensional HL tool. Previous studies have used cancer literacy tools

that capture only a partial domain (reading ability; Mazor et al., 2014) or cancer knowledge instead (Roman et al., 2014). An increasing number of researchers seem to promote content-specific HL assessment (as opposed to general HL) within a particular context, such as high blood pressure or genetics (Apter et al., 2006; Erby et al., 2008); the evidence suggests that these content-specific HL tools effectively predict improved knowledge following generic education (Erby et al., 2008), better hemoglobin A1C (Cavanaugh et al., 2009), and improvements in quality of life and asthma control (Apter et al., 2006). The findings underscore the importance of using a validated content-specific HL tool, such as the Assessment of Health Literacy in Cancer Screening used in the current study, for an adequate understanding of HL in relation to a target health behavior. Nevertheless, our HL measurement model demonstrated excellent fit in two of the four criteria used. One possible explanation may be the numeracy subscale, which had a minimally satisfactory level of internal consistency reliability coefficient of 0.70 (Han et al., 2014): In the original validation study, the numeracy subscale resulted in significant, yet low correlation coefficients with known correlates of HL, such as age and education ($r = -.022$ and 0.25 , respectively). The numeracy subscale was built on the Newest Vital Sign, which has yielded low internal consistency ranging from 0.69 to 0.76 in English-speaking and Spanish-speaking patients in primary care (Osborn et al., 2007). Future research efforts should include more advanced item assessment techniques, such as item response theory, to investigate detailed functioning of the items across diverse samples.

This study has several limitations. First, given the nature of cross-sectional data, causality cannot be inferred. Second, Pap test use was assessed by self-reporting at baseline; thus, Pap test rates might have been over- or underestimated. Studies have demonstrated 70%–87% agreement rates between self-reports and Pap test use, as verified by medical record reviews (Caplan et al., 2003). Third, changes have been made in the recommended clinical guidelines regarding cervical cancer screenings over the past few years, with inconsistent advice being shared among the agencies that publish cancer screening guidelines (U.S. Preventive Services Task Force, 2012). These changes and variations might have affected women's decisions to use Pap tests more often than usual. The two instruments measuring decisional balance and self-efficacy have not been validated with a Korean sample; however, both measures were validated among immigrant women in the U.S., with good internal consistency reliability. Finally, participants were recruited from ethnic churches on the East Coast, thereby limiting the generalizability of the study's findings. Epidemiological research indicates that at least 85% of Korean Americans attend ethnic churches weekly (Kim et al., 2001), making churches an ideal research site for the target population.

4.2. Conclusion

HL had an essential yet indirect role in Pap test use among KAW. In particular, we were able to identify possible pathways through which HL influenced KAW's Pap test use with critical psychosocial determinants. Provider's advice influenced KAW's Pap test use both directly and indirectly. Traditional intervention programs have focused mainly on improving cancer knowledge or addressing barriers with short-lived effects. Future interventions should consider using skill-based approaches, such as HL training, as well as targeting critical

psychosocial determinants and promoting patient–physician communication as potentially sustainable ways of promoting Pap test use.

4.3. Practice implications

To close disparities in KAW's Pap test use, our findings have implications for health care providers. A provider's advice had the strongest direct effect on KAW's Pap test use, yet only 16% of the sample received the provider advice to have a Pap test. Thus, providers need to acknowledge the impact of their advice on Pap tests in promoting KAW's Pap test use. One possible communication strategy is that providers target changes in decisional balance toward positive directions and promote self-efficacy to increase KAW's Pap test use. Another strategy is that providers increase a woman's HL as a step towards maintaining sustainable KAW's Pap test use before offering intensive education targeting psychosocial determinants such as knowledge, perceptions, and self-efficacy for the education to be successful. For example, promoting HL using the teach-back method (Kripalani & Weiss, 2006; Lor & Bowers, 2014) can result in promoting cancer knowledge that influences perceptions about Pap test use, enhancing positive perceptions and decreasing negative perceptions about Pap test use, and increasing confidence in receiving Pap tests. This then leads to increased Pap test use. Increasing HL among underserved immigrant women can build cognitive skills to understand and process relevant information and make an appropriate decision regarding Pap test use.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Figure 1.
Conceptual measurement and structural model of health literacy and Pap test use
The dotted line indicates additional pathways that we suggest based on the findings of previous studies.

Figure 2.

Structural model of health literacy and Pap test use

Structural equation modeling was performed with robust weighted least squares approach.

Path coefficients are standardized. Fit indices were as follows: CFI=0.934, RMSEA=0.055 (90% CI 0.045 0.065), TLI=0.909, and $\chi^2/df(158/59)=2.678$.

*p<0.05, **p<0.001

— : Significant path

- - - : Non-significant path

Table 1.

Measurement model of health literacy

Indicators	Factor loading	S.E.	p-value
Familiarity	0.730	0.027	<0.001
Comprehension	0.884	0.018	<0.001
Navigation	0.870	0.018	<0.001
Reading ability	0.733	0.028	<0.001
Numeracy	0.419	0.042	<0.001

The measurement model was constructed with robust weighted least squares (WLSMV) approach. Fit indices were as follows: Comparative fit index=0.991, root mean square error of approximation=0.087 (90%CI 0.056, 0.121), Tucker-Lewis index=0.981, and χ^2/df (26/5)=5.2.

Table 2.

Fit Indices of Model 1 (full model) and Model 2 (nested model)

Model	χ^2	df	χ^2/df	CFI	RMSEA	TLI
Model 1	170	67	2.537	0.927	0.052	0.902
Model 2	158	59	2.677	0.934	0.055	0.909

CFI: Comparative Fit Index; RMSEA: Root Mean Square Error of Approximation; TLI: Tucker-Lewis Index

Table 3.

Statistics for the indirect effect of the final model

Pathway	Indirect effect (SE)	p-value
Primary Aim – Pathways in which HL affects Pap tests		
Sum of indirect effects from HL to Pap tests	.125 (.031)	<0.001
HL→knowledge→Pap tests	.023 (.017)	.148
HL→decision balance→Pap tests	.043 (.020)	.010
HL→knowledge→decisional balance→Pap tests	.023 (.007)	<0.001
HL→self-efficacy→Pap tests	.037 (.017)	.020
Secondary Aim – Effects of provider advice on HL, mediators and Pap tests		
Provider advice→HL→knowledge	.104 (.036)	.003
Sum of indirect effects from provider advice to decisional balance	.145 (.049)	<0.001
Provider advice→knowledge→decisional balance	.060 (.040)	.046
Provider advice→HL→decisional balance	.056 (.026)	.020
Provider advice→HL→knowledge→decisional balance	.029 (.011)	.004
Provider advice→HL→self-efficacy	.072 (.029)	.009
Sum of indirect effects from provider advice to Pap tests	.233 (.059)	<0.001
Provider advice→HL→knowledge→Pap tests	.008 (.008)	.184
Provider advice→HL→decisional balance→Pap tests	.016 (.009)	.036
Provider advice→HL→knowledge→decisional balance→Pap tests	.008 (.004)	.010
Provider advice→HL→self-efficacy→Pap tests	.014 (.008)	.051
Provider advice→knowledge→Pap tests	.017 (.018)	.223
Provider advice→decisional balance→Pap tests	.080 (.037)	.015
Provider advice→knowledge→decisional balance→Pap tests	.017 (.012)	.061
Provider advice→self-efficacy→Pap tests	.073 (.032)	.037

HL: Health Literacy. Structural equation modeling was performed with robust weighted least squares (WLSMV) approach to get standardized path coefficients. Bootstrap was used to obtain standard errors.