

Personal Background and Cognitive Factors as Predictors of the Intention to be Screened for Stomach Cancer

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Abstract

Although stomach cancer screening is effective for reducing mortality, it is underutilized in Korea. By applying an extended theory of planned behavior model, our objective was to determine how personal background factors influence a patient's inclination to be screened for stomach cancer. The study population was derived from the 2006 Korean National Cancer Screening Survey, which was done to investigate the participation of the general population in cancer screening. In total, 1,509 Koreans who were 40 to 70 years old participated in this study. Path analysis was used to test a conceptual model in which (a) factors considered as precursors to be screened (components in theory of planned behavior model) directly pre-

dicted the intention to be screened and (b) personal background factors, including sociodemographic factors, previous screening experience, economic status, and perceived risk, indirectly influenced the intention to be screened through their effects on cognitive components such as attitude and subjective norm in the theory of planned behavior model. Most of the personal background factors did not directly influence intention but instead influenced cognitive elements in the theory of planned behavior model. Attitude and perceived behavioral control were well correlated with a patient's intention, regardless of the screening cost. (Cancer Epidemiol Biomarkers Prev 2008; 17(9):2473–9)

Introduction

Every year, >100,000 Koreans are diagnosed with cancer, making it the leading cause of death in Korea (1). Stomach cancer, which is the most frequent type of cancer in both men and women (1, 2), is the fifth most common malignancy among developed countries and the fourth most common malignancy among developing countries (3).

Although cancer screening is effective at reducing mortality, it is underutilized in Korea. Screening programs enable the early detection of cancer in patients, allowing therapy to be promptly initiated (4). Since 1999, the Korean government has operated the National Cancer Screening Program (NCSP) for people on medical aid and for national health insurance beneficiaries within the lower 50% contribution rate (5). The NCSP offers free screening for five major types of cancer: stomach, breast, cervical, colorectal, and liver. Nevertheless, only 19.3% of Koreans participated in the NCSP in 2005. Although stomach cancer is the most common cancer in Korea, the rate of participation in the NCSP for

stomach cancer screening is only 20.1%, which is lower than the rates for liver (25.2%) and breast cancer screening (24.1%; ref. 6).

The estimated percentage of the Korean population who are in compliance with stomach cancer screening guidelines (screening every 2 years in men and women of ≥ 40 years of age) is 39.2%, which is lower than that for breast (42.5%) or cervical (58.3%) cancers (7). Insight about factors that facilitate or impede participation in the stomach cancer screening program may be helpful in improving participation rates. Most studies conducted in other countries have focused on participation in breast (8-15) or prostate cancer (16, 17) screening programs, which is one reason that these two cancers are the most frequently diagnosed in both women and men. Given that stomach cancer is the leading cause of cancer death in Korea, this study focused on the intention to receive stomach cancer screening. The NCSP recommends stomach cancer screening by upper endoscopy or upper gastrointestinal series every 2 years for people of ≥ 40 years of age.

In this study, an extended theory of planned behavior was used to determine factors influencing participation in the stomach cancer screening program. The theory of planned behavior is a popular theoretical model for designing strategies to help people adopt healthy behaviors (18) and has been applied in several studies (19). The theory posits that a person's intention is the most important predictor of behavioral performance (19, 20) and that intention is influenced by attitude, subjective norm, and perceived behavioral control toward a behavior.

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Using the theory of planned behavior model, some health-behavior studies have proposed that sociodemographic factors, previous screening experience, economic status, and perceived risk may affect not only intention and behavior but also attitude, subjective norm, and perceived behavioral control (8, 11, 16, 17, 21, 22).

One purpose of this study was to evaluate the intentions of Koreans, 40 to 70 years old, to be screened for stomach cancer. To examine the relationship between the willingness of patients to undergo cancer screening and the burden of the screening cost, each participant was offered three payment options: (a) no payment, (b) a copayment, or (c) full price. A second purpose was to identify factors that influence a person's intention to be screened using an extended theory of planned behavior model, which included personal background factors that influence cognitive elements in the theory of planned behavior, and determine how personal background factors were implicated in the decision process.

Materials and Methods

Study Design and Samples. Based on the theory of planned behavior, this study was designed to investigate factors that influence a patient's intention to participate in a stomach cancer screening program. The applied model for this study is depicted in Fig. 1. For this model, sociodemographic factors, the economic burden of screening, previous experience of stomach cancer screening, and the perceived risk for becoming ill with stomach cancer were proposed as factors potentially influencing cognitive elements such as attitude, subjective norm, and perceived behavioral control. Finally, cognitive elements in theory of planned behavior that influence a subject's intention to be screened for stomach cancer were investigated.

The study population was derived from the 2006 Korean National Cancer Screening Survey, which was

done to investigate participation rates of the general population in cancer screening. In total, 4,687 men and women were selected by stratified random sampling from a population-based database. Face-to-face interviews done by investigators from a professional research agency were completed by 2,033 subjects (response rate, 43.4%). Of the 2,033 participants, male and female subjects who were cancer-free and 40 to 70 years old were included in this study. In total, 1,509 participants were finally selected as study subjects.

Measurement Instruments. Questionnaire items to measure attitude, subjective norm, perceived behavioral control, and intention were developed using a direct measurement method (14, 16, 18). In addition, sociodemographic variables, the economic burden of screening, previous experience with stomach cancer screening, and the perceived risk for becoming ill with stomach cancer were included in the questionnaire (8, 16, 21).

We established three cost conditions for screening: (a) free of charge, (b) with a copayment, and (c) at full price. We defined the copayment as 20% of the total charge, with the National Health Insurance Company in Korea paying the remaining 80%. The intention was guided by the target, action, context, and time principles of Ajzen (23). Two items were developed to measure the intention to be screened for stomach cancer under each cost condition: (a) "Do you intend to have stomach cancer screening in the next 2 years?" and (b) "Do you want to have stomach cancer screening in the next 2 years?" The responses were quantified using a 5-point Likert scale.

Attitude was measured using a semantic differential scale and responses to: "When I think about getting screened for stomach cancer in the next 2 years, I feel it is (1) Beneficial/Unbeneficial, (2) Important/Unimportant, and (3) Painful/Not painful".

The following items were used to measure the subjective norm component: (a) "Most people who are important to me (family members/friends/neighbors

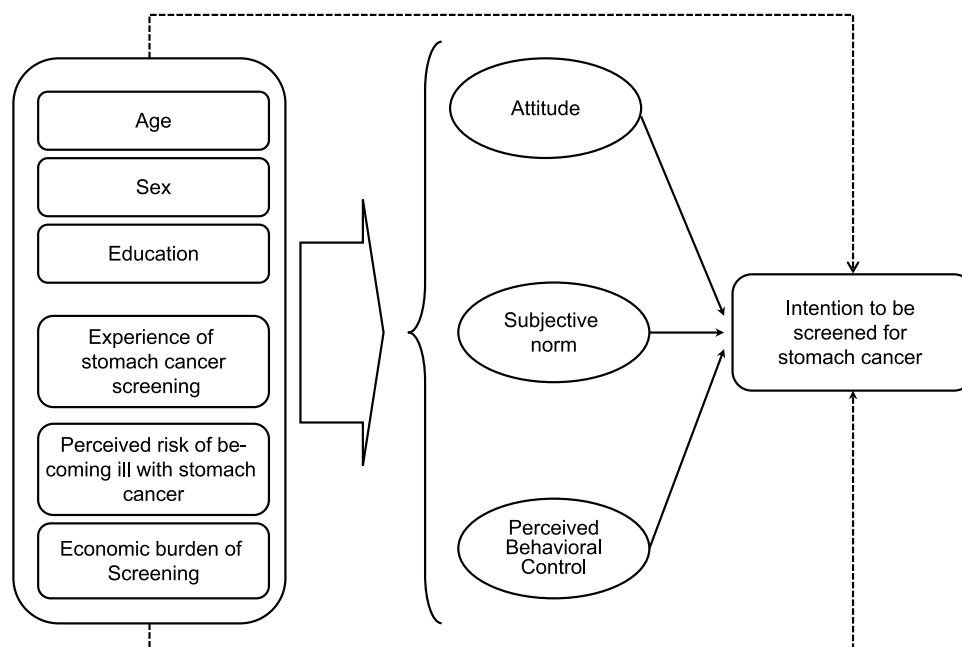


Figure 1. Theoretical path model of intention to receive stomach cancer screening.

Table 1. Descriptive information of the sample population (n = 1,509)

Variable	All (%)	Male (%)	Female (%)
Gender			
Male	752 (49.8)		
Female	757 (50.2)		
Age (y)			
40-49	693 (45.9)	356 (47.3)	337 (44.5)
50-59	434 (28.8)	222 (29.5)	212 (28.0)
60-69	382 (25.3)	174 (23.2)	208 (27.5)
Continuous value*	52.3 (8.58)	51.99 (8.37)	52.62 (8.78)
Education (y)			
<9	316 (20.9)	93 (12.4)	223 (29.4)
9 ≤ X < 12	285 (18.9)	124 (16.5)	161 (21.3)
12 ≤ X < 16	675 (44.7)	364 (48.4)	311 (41.1)
≥16	233 (15.5)	171 (22.7)	62 (8.2)
Income (\$)			
<1,000	80 (5.3)	36 (4.8)	44 (5.9)
1,000-1,999	604 (40.3)	292 (39)	312 (41.5)
2,000-2,999	746 (49.7)	392 (52.3)	354 (47.1)
≥3,000	70 (4.7)	29 (3.9)	41 (5.5)
Marital status			
Single	26 (1.7)	20 (2.7)	6 (0.8)
Married	1,367 (90.6)	699 (92.9)	668 (88.2)
Other	116 (7.7)	33 (4.4)	83 (11.0)
Residence			
Metropolitan area	714 (47.3)	357 (47.5)	357 (47.2)
Urban	607 (40.2)	308 (40.9)	299 (39.5)
Rural	188 (12.5)	87 (11.6)	101 (13.3)
Job			
Nonmanual	183 (12.1)	147 (19.6)	36 (4.7)
Manual	831 (55.1)	510 (67.8)	321 (42.4)
Housewives	390 (25.8)	0 (0)	390 (51.5)
Unemployed	99 (6.6)	91 (12.1)	8 (1.1)
Other	6 (0.4)	4 (0.53)	2 (0.3)
Experience of stomach screening			
No	699 (46.3)	381 (50.7)	318 (42.0)
Yes	810 (53.7)	371 (49.3)	439 (58.0)
Perceived risk for becoming ill with stomach cancer			
Low	818 (54.2)	399 (53.1)	419 (55.4)
Medium	596 (39.5)	303 (40.3)	293 (38.7)
High	95 (6.3)	50 (6.6)	45 (5.9)
Continuous value (5-point Likert scale)*	2.46 (0.81)	2.47 (0.82)	2.44 (0.8)
Economic burden of screening			
Burden	1,161 (76.9)	546 (72.6)	615 (81.2)
Not a burden	348 (23.1)	206 (27.4)	142 (18.8)
Continuous value (4-point Likert scale)*	1.94 (0.8)	2.02 (0.81)	1.86 (0.78)

*Mean (SD).

think I should be screened for stomach cancer," (b) "I generally do what most people who are important to me think I should do," (c) "Most people in my life whose opinions I value get screened for stomach cancer," and (d) "I am expected to get screened for stomach cancer."

A 5-point Likert scale (agree/disagree) was used to obtain the subjective norm.

To measure the perceived behavioral control, a 5-point Likert scale was used to score four items reflecting a person's level of confidence in doing the target behavior

Table 2. Descriptive statistics for the cognitive variables in the theory of planned behavior model (n = 1,509)

Measurement variable	N	Items	Mean	SD	Cronbach's α
Attitude	1,509	2	3.31	0.82	0.690
Subjective norms	1,509	4	3.46	0.82	0.768
Perceived behavioral control	1,509	3	3.80	0.80	0.705
Intention 1	1,509	2	3.99	1.17	0.966
Intention 2	1,509	2	3.72	1.21	0.968
Intention 3	1,509	2	2.78	1.24	0.967

Intention 1: intention to be screened for stomach screening if it is free of charge in next 2 y.

Intention 2: intention to be screened for stomach screening if it requires a copayment in next 2 y.

Intention 3: intention to be screened for stomach screening if it is full price in next 2 y.

Table 3. Standardized β coefficient of path analysis influencing the intention to be screened for stomach cancer ($n = 1,509$)

Dependent variable	Attitude			Subjective norm		
	β	<i>P</i>	R^2	β	<i>P</i>	R^2
Independent variable						
Age	-0.021		0.126	0.065	*	0.113
Sex (male/female)	0.031			0.049		
Education (reference, <9 y), y						
$9 \leq X < 12$	0.090	†		0.089	†	
$12 \leq X < 16$	0.115	†		0.148	‡	
>16	0.130	‡		0.131	‡	
Experience of stomach screening (no/yes)	0.299	‡		0.271	‡	
Perceived risk for becoming ill with stomach cancer	0.117	‡		0.115	‡	
Economic burden of screening	0.026			0.039		
Attitude						
Subjective norm						
Perceived behavioral control						

* $P < 0.05$.† $P < 0.01$.‡ $P < 0.001$.

(18): (a) "For me to receive stomach cancer screening in the next 2 years would be (Possible/Impossible)," (b) "I am confident that I could receive stomach cancer screening if I wanted to" (definitely true/definitely false), (3) "It is mostly up to me whether I receive stomach cancer screening in the next 2 years" (agree/disagree), and (d) "The decision to receive stomach cancer screening in the next 2 years is beyond my control" (agree/disagree). Questionnaires about intention, attitude, subjective norm, and perceived behavioral control were not available in the Korean language, and therefore, questionnaires written in English were translated into Korean and then translated back into English to confirm the accuracy of the translation.

The measure of socioeconomic status was based on education level (four categories), monthly household income (four categories), and job level (five categories). We adopted the education variable in the final analysis because the income and job variables did not affect the dependent variables independent of education.

The economic burden of screening was measured using a 4-point Likert scale (definitely no/definitely yes) to score the response to the following question: "Are you burdened by the charge for cancer screening?" Whether the subject had previously received stomach cancer screening was measured dichotomously. We measured perceived risk by asking respondents to rate the likelihood that they would become ill with stomach cancer in the future: (a) "What is the chance that you will develop stomach cancer in the future?" and (b) "Compared with the average person of your age, what do you think are your chances of developing stomach cancer?" Response options were on a 5-point Likert scale (much lower/much higher).

Analysis. A test of internal consistency and a descriptive analysis of the collected data were done using SAS (version 8.0, SAS Institute). STATA (version 9.2) was used for path analysis to determine how sociodemographic and other background factors influence attitude, subjective norm, perceived behavioral control, and intention to receive stomach cancer screening and to identify correlates of intention.

Results

Sample Characteristics. Of the 1,509 people who participated in the survey, nearly 46% were 40 to 49 years old. The mean age of the participants was 52.3 years. Nearly 40% of the participants had not completed high school, whereas 15.5% had some university-level education. More than half of the participants had been screened for stomach cancer before participating in the survey (53.7%) and thought that their possibility of acquiring stomach cancer in the future was low (54.2%). The descriptive information of the participants is presented in Table 1.

Intention and Cognitive Components of the Theory of Planned Behavior Model. The intention to receive stomach cancer screening was likely to be high if the screening was offered free of charge or with a copayment. When screening was available only at full charge, the probability that a person would receive screening was relatively low, compared with the free-of-charge or copayment scenarios (Table 2).

We confirmed the internal consistency of the items to measure the components of this study model based on Cronbach's α . The item "When I think about getting screened for stomach cancer in the next 2 years, I feel it is Painful/Not painful" to measure attitude was excluded. The item "It is mostly up to me whether I receive stomach cancer screening in the next 2 years" to measure the perceived behavioral control was excluded. To measure perceived risk, we used two items, and the internal consistency was good. The items to measure the intention to be screened for stomach cancer were reliable.

Correlates of the Intention to Receive Stomach Cancer Screening. The factors that were most predictive of a subject's intention to receive stomach cancer screening were explored in a path analysis (Table 3). With regard to the factors influencing the components of the theory of planned behavior model, the education level, experience with stomach cancer screening, and perceived risk affected all of the components independently of the cost for screening; however, the economic burden of screening influenced only the perceived

Table 3. Standardized β coefficient of path analysis influencing the intention to be screened for stomach cancer ($n = 1,509$) (Cont'd)

Perceived behavioral control			Intention 1			Intention 2			Intention 3		
β	<i>P</i>	R^2	β	<i>P</i>	R^2	β	<i>P</i>	R^2	β	<i>P</i>	R^2
-0.014		0.107	-0.039		0.333	-0.025		0.321	-0.009		0.242
0.056	*		0.006			0.004			0.011		
0.106	†		-0.030			0.033			0.039		
0.186	‡		-0.041			0.059			0.138	‡	
0.172	‡		-0.034			0.034			0.107	†	
0.268	‡		0.103	‡		0.021			0.043		
0.056	*		0.033			0.048	*		0.042		
0.062	*		-0.127	‡		-0.055	*		0.095	‡	
			0.230	‡		0.240	‡		0.110	†	
			0.009			0.048			0.126	‡	
			0.338	‡		0.319	‡		0.248	‡	

behavioral control. Most of the personal background factors did not directly affect intention but did produce an effect through the cognitive factors of the theory of planned behavior model.

When the screening was offered free of charge or for a copayment, the attitude ($\beta = 0.230$) and perceived behavioral control ($\beta = 0.338$) toward receiving the screening had direct significant effects on the intention to receive stomach cancer screening. Experience with stomach cancer screening was a correlate of intention when the screening was free of charge ($\beta = 0.103$), and perceived risk of becoming ill with stomach cancer was a correlate of intention when the screening was offered with a copayment ($\beta = 0.048$). The economic burden of screening negatively influenced intention when the screening was offered free of charge ($\beta = -0.127$) or with a copayment ($\beta = -0.055$).

When the screen was offered for full price, all of the theory of planned behavior components were significantly correlated with intention. People with a high level of education and low economic burden of screening intended to be screened. In all cases, the perceived behavioral control was strongly correlated with the intention to be screened for stomach cancer.

Discussion

We applied an extended theory of planned behavior model to clarify the utilization of stomach cancer screening among people of 40 to 70 years of age, which is the age group designated to receive screening by national guidelines. We hypothesized that sociodemographic factors, the economic burden of screening, experience with stomach cancer screening, and the perceived risk for becoming ill with stomach cancer might affect the attitude, subjective norm, and perceived behavioral control toward stomach cancer screening, and that these cognitive elements in the theory of planned behavior influence a person's intention to receive screening. The theory of planned behavior model can efficiently explain health-related behaviors such as clinical and screening visits and addictive, automobile-related, and eating behaviors (19).

Most of the people in this study were likely to intend to receive stomach cancer screening if it were offered free

of charge or for a copayment, rather than at full price. In particular, people who felt burdened by the screening cost were likely to intend to receive stomach cancer screening when it was available free of charge or with a copayment, indicating that national level screening programs could increase the cancer screening rate by offering screening for a reduced price. The NCSP in Korea offers free screening for five major types of cancer: stomach, colorectal, liver, breast, and cervical cancers. Furthermore, in 2006 the National Health Insurance Company began supporting 80% of the screening charges for the five major cancers for beneficiaries wanting to receive cancer screening (5).

We confirmed how sociodemographic factors, the economic burden of screening, previous experience with stomach cancer screening, and the perceived risk for becoming ill with stomach cancer influenced the cognitive factors in the theory of planned behavior model and the intention to be screened. Most of the factors with potential to influence cognitive elements in the theory of planned behavior model did not directly and consistently influence the intention to be screened; however, some of the personal background factors influenced the intention to be screened depending upon the screening cost. These results suggest that personal background factors may not directly influence the intention to receive stomach cancer screening but may produce effects, through cognitive elements the theory of planned behavior model.

Previous experience with stomach cancer screening positively influenced the intention to receive screening when it was available free of charge. This result suggests that a continuous NCSP could prompt more people to receive periodic stomach cancer screening. Montano et al. (11) confirmed a significant correlation between previous experience with breast cancer screening and intention. Steele and Porche et al. (14) reported that people who had experience with a prostate-specific antigen (PSA) test to screen for prostate cancer were likely to have a high intention of requesting a PSA test in the future. An awareness of the screening cost negatively influenced the intention when screening was not available free of charge or for a copayment. This indicates that the NCSP could serve an important role in increasing the rate of participation in cancer screening. When screening was offered for full price a high education level and low economic burden of screening

directly influenced the intention to be screened. Because income is positively associated with education level, it may be that people with a higher income would be more likely to be screened for full price.

In this study, we hypothesized that some factors might influence the cognitive elements of the theory of planned behavior model but not intention. The theory of planned behavior model assumes that factors other than attitude, subjective norm, and perceived behavioral control are operating and that they do not independently explain the likelihood that a person will behave in a certain way (24).

Attitude and perceived behavioral control were good correlates of intention, regardless of screening cost. In particular, the perceived behavioral control toward stomach cancer screening was the most powerful correlate of intention. The subjective norm influenced the intention to receive screening only when it was available at full price. Based on these results, it seems possible that the inclination to receive screening and the participation rate could be increased through education and public relations. With regard to the subjective norm, Korean patients are likely to be influenced by their families, colleagues, and relatives when seeking medical treatment (25). Therefore, those who intend to receive stomach cancer screening at full charge are likely to recognize the screening as a medical treatment. Based on these results, we might conclude that cognitive components of theory of planned behavior are major factors for agreeing to stomach cancer screening.

This study helps to clarify the correlates of a subject's intention to receive stomach cancer screening; however, some limitations must be acknowledged. First, it was difficult to identify causality because this study was cross-sectional. Causality cannot be determined with cross-sectional survey data and future prospective studies will need to confirm the associations reported here. Most studies using the theory of planned behavior model to assess screening behavior have simultaneously surveyed cognitive factors and intention, and then checked behavior (8, 9, 12, 14). We need to do a further study to confirm that the intention to receive stomach cancer screening influences the behavior. Second, we measured the attitude, subjective norm, perceived behavioral control, and intention using a direct method. Each predictor in the theory of planned behavior model can be measured directly or indirectly (18). Although direct measurement approaches often reveal interesting results, they can produce relatively low reliabilities and underestimate the relationships among variables in the theory of planned behavior model (23). Therefore, a further explanation of the relationship between predictors and intention would be useful (18, 23). This study did not identify the factors that influence stomach cancer screening behavior. Third, this study did not separately measure theory of planned behavior components compared with measuring intention according to cost condition. To better understand the factors that affect the intention to be screened for stomach cancer, theory of planned behavior components should be measured for each cost condition. The applied model for this study explained 24.1% to 33.3% of the variance for the intention. These prediction levels are comparable with those of other cancer-screening studies (14, 16, 21).

However, the poorer predictive value of the intention to receive full-cost screening may result from subjects' thinking that test costs would be covered in return for participating in the study. If we had measured theory of planned behavior components specifying cost condition, the prediction might have been better. However, it may be impractical to survey by specifying cost condition because it would triple the number of questions for that single item. Despite these limitations, the results of this study can be generalized because nationwide survey data were used.

In conclusion, most of the personal background factors, including socioeconomic status, experience, perceived risk, and economic burden of screening, produced an effect through the cognitive components of the theory of planned behavior model. The perceived behavioral control was better than attitude and subjective norm at predicting intention. Encouraging individuals to receive stomach cancer screening should be actively pursued.

Disclosure of Potential Conflicts of Interest

No potential conflicts of interest were disclosed.

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BLOOD CANCER DISCOVERY

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