

RESEARCH ARTICLE

Factors Affecting Cancer Screening Intention and Behavior of the Korean Elderly

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Abstract

Background: In this study we investigated factors influencing cancer screening intention and behavior to develop measures to increase the rate of cancer screening in the Korean elderly. **Materials and Methods:** Participants included 425 elderly subjects 65 years of age or older from D city, South Korea. The health behavior characteristics and cancer screening-related and theory of planned behavior (TPB) factors influencing the participant attitudes on cancer screening were examined to identify determinants significantly affecting cancer screening intentions and behavior. **Results:** Predictive factors influencing cancer screening behavior included smoking, exercise, cancer concerns, preference for the type of cancer screening, prior experience with the National Cancer Screening Program, perception of the National Cancer Screening Program, behavioral control with respect to cancer screening and cancer screening intentions. The factors influencing cancer screening behavior were different from those for cancer screening intentions. **Conclusions:** Increasing the cancer screening intentions of the elderly is necessary to raise the rates of cancer screening. Additionally, identifying the inhibitory factors that serve as obstacles to cancer screening in the elderly and changing screening intentions into actual screening behavior is necessary. This study provides a reference for developing and applying policy measures and intervention strategies to increase the cancer screening rates of the elderly in Korea.

Keywords: Elderly - cancer screening - intention - behavior - Korea

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Introduction

Due to developments in medical technology and living conditions, life expectancy has increased, and the percentage of elderly individuals has risen steadily. South Korea, in particular, will enter the aging phase of society in 2018 when the percentage of adults over the age of 65 years is predicted to exceed 14% (Statistics Korea, 2012). However, compared with the rapidly increasing life expectancy, the healthy life expectancy living free from diseases or injuries is very low by 71 years of age. Such a discrepancy between life expectancy and healthy life expectancy is indicative of the poor health conditions among the elderly in South Korea (Yoon et al., 2009).

Typically, the cause of death in the elderly is due to chronic degenerative diseases, such as cardiovascular diseases, respiratory diseases and cancer (Statistics Korea, 2012). The incidence of cancer increases with age, peaking between 70 and 80 years of age. With the recent increase in the average life expectancy, the prevalence of cancer in the elderly has increased dramatically. Approximately 36.2% of the Korean elderly will develop cancer during their average 81-year life expectancy, and the cancer incidence is 1 per 17 people in subjects 65 years of age or older (National Cancer Information Center, 2010).

To decrease the death rate and the prevalence of cancer while improving the quality of life of cancer patients, the World Health Organization (WHO) recommended facilitation of early cancer screening and instituting nationalized efforts for cancer management as the most effective method. In South Korea, a national 10-year program to fight cancer has been instituted since 1996 to increase the healthy life expectancy by decreasing the prevalence of and death from cancer (Lee, 2011). In South Korea, identifying the current state of early cancer screening is difficult because of the diverse means by which people receive early screening tests. For example, the National Cancer Screening Program targets the low-income population, the National Health Insurance Service (NHIS) targets the general public, and many cancer screenings are provided by private clinics (Kwak et al., 2005).

Early diagnosis is particularly important for the elderly in whom the majority of cancer diagnoses tend to be late-stage, advanced cancers, which may partially explain why the cancer survival gap between elderly and middle-aged patients is widening (Quaglia et al., 2009). According to the statistics provided by the NHIS, the cancer screening rate has increased consistently from 13% in 2003 to 45.3% in 2009 to 47.8% in 2010

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(National Health Insurance Service, 2012). However, the above screening rates are lower than those in developed countries, such as 75.5% for breast cancer and 80.3% for cervical cancer in Great Britain in 2005 and 52.0% for colon cancer and 70.0% for breast cancer in the United States in 2003 (Vainio and Bianchini, 2002; National cancer center, 2012; Yang, 2012). In particular, the cancer screening rate was relatively high for people in their 40s and 50s but lesser so for those in their 60s in South Korea (Choi, 2007). Therefore, a strategic development plan is necessary to increase cancer screening rates in the elderly (Kim et al., 2003). Although the aggressive governmental health promotion program has improved the overall health level of the population, the perception and rates of cancer screening remain low in medically vulnerable populations such as the elderly. Therefore, a policy recommending and facilitating cancer screening specifically targeting the elderly is necessary.

Prior studies in the Korean adult population suggested that the reason for the low cancer screening rates was because people believed they were healthy and asymptomatic (Hwang et al., 2002; Oh et al., 2010). Studies have reported that the factors influencing the cancer screening rate include the intention to receive screening, general health screening, age, education level, regular visits to the doctor and regular exercise (Valentiny et al., 2012; Suh et al., 2013). However, studies investigating the factors influencing screening rates in the elderly are limited. Consequently, this study was performed to investigate the factors that influence cancer screening intention and behavior as a means of developing measures to increase the cancer screening rate in the Korean elderly.

Materials and Methods

Study population

The 465 study participants were selected from a sampling of individuals aged 65 years and older from four elderly community centers in D city. The study sample size was determined based on the sample size computed for a correlational study using a significance level of 0.05, 95% confidence intervals (95%CI) and an effect size of 0.15 using the G* power program, which accounted for the expected dropout rate and resulted in a final sample size of 465. Participants who were currently diagnosed with or treated for cancer were excluded from the study. The participants who understood the purpose of and volunteered to participate in this study were ultimately selected. Of the 465 participants, 40 with incomplete surveys or inadequate responses were excluded from the study, resulting in a total of 425 final participants included in the data analysis.

Health- and cancer screening-related characteristics of the elderly

The study used a structured questionnaire developed by Kim et al. (2010), which was adjusted for the purposes of the present study using a literature review. The content validity of the questionnaire was reviewed by two nursing professors and one preventive medicine professor.

The survey comprised 26 questions, seven regarding sociodemographic characteristics, 11 regarding health behavioral characteristics and eight regarding cancer screening-related characteristics.

Theory of planned behavior (TPB) related characteristics

The theory of planned behavior (TPB) variables that affect cancer screening attitude were the compositional factors used to apply Ajzen's TPB to this study. Based on the questionnaire developed by Kim et al. (2003; 2010), we adjusted the TPB variables for the purpose of this study. The survey regarding the TPB was composed of the following: five questions on behavioral attitudes, three on subjective norms, five on perceived behavioral control and three on cancer screening intentions. The responses were evaluated on a 5-point Likert scale in which higher scores indicated more positive behavioral attitudes, subjective norms, perceived behavioral and cancer screening intentions with respect to cancer screening behavior. The Cronbach's alpha in this study was 0.762.

Data collection

The data collection was performed between June 1 and July 31 of 2012 after receiving approval (MC12QNSI0101) from the Institution Review Board of C University. To conduct the study, we visited six elderly community centers in D city to receive prior consent from the respective administrators. After explaining the study purpose and procedure, we received informed consent from the participants and conducted the survey. The data collection method consisted of reading the structured survey to the participants and recording their responses. The approximate time to complete each survey was 15 minutes, and a small souvenir was presented to each participant upon completion.

Data analysis

The collected data were analyzed using SPSS for Windows Version 18.0 (SPSS Inc., Chicago, IL, USA).

The general and cancer screening-related characteristics of the participants were expressed using actual numbers, frequencies, percentiles, means and standard deviations. To compare the cancer-screened and -unscreened groups with respect to their general cancer screening-related and TPB characteristics, the chi-square test and t-test were used. The cancer screening status and intentions were analyzed according to the variables using the chi-square test, t-test and one-way ANOVA. To verify the factors influencing cancer screening intentions and cancer screening behavior, stepwise multiple linear regression and multiple logistic regression were performed.

Results

Cancer screening intentions and experience based on the participants' general characteristics

The characteristics of the participants are presented in Table 1. Of the 425 participants, 301 (70.8%) were screened for cancer within the last 2 years, while 124 (29.2%) were not. The actual cancer screening behavior of the participants based on their general characteristics

varied significantly by gender ($p=0.030$), age ($p=0.038$) and family composition ($p<0.001$). The cancer screening intentions of females were higher than those of males ($p=0.046$), but there were no significant differences in terms of the other general characteristics (Table 1).

Cancer screening intentions and experience according to the health behavior and cancer screening-related characteristics of participants

The categories that showed significant differences between the screened and unscreened groups were smoking ($p=0.026$), exercise ($p<0.001$), weight control ($p<0.001$), interest in health ($p<0.001$), cancer concerns ($p<0.001$), experience of the National Cancer Screening Program ($p<0.001$), preference for the type of cancer screening ($p<0.001$) and the perception of the National Cancer Screening Program ($p<0.001$).

The factors that significantly influenced the cancer screening intentions were smoking ($p=0.002$), exercise ($p=0.005$), health condition ($p=0.026$), weight control ($p<0.001$), interest in health ($p<0.001$), cancer concerns ($p<0.001$), prior cancer screening experience ($p\leq 0.001$), preference for the type of cancer screening ($p<0.001$), perception of the National Cancer Screening Program ($p<0.001$) and experience with the National Cancer Screening Program ($p<0.001$). Cancer screening intentions were lower in the participants who were currently smoking, minimally exercising and not practicing weight control. The cancer screening intentions were higher in the participants with a high interest in health, high cancer concerns, prior experience with cancer screening, prior experience with the National Cancer Screening Program and high perception of the National Cancer Screening Program (Table 2).

Cancer screening behavior according to TPB variables

The screened participants showed better behavioral attitudes ($p<0.001$), subjective norms ($p<0.001$) and cancer screening intentions ($p<0.001$) compared with the unscreened. In addition, perceived behavioral control scored lower in the screened than in the unscreened participants ($p<0.001$; Table 3).

Factors influencing cancer screening intentions

The results of the stepwise multiple linear regression performed to investigate the factors influencing cancer screening intentions are shown in Table 4. The variables that showed a significant association with cancer screening intentions were included as variables in the regression analysis. The categorical independent variable was adjusted as a dummy variable, and multicollinearity diagnostics were performed. The tolerance limit of all of the variables were over 0.1 (0.540 ~0.962), and the variance inflation factor was below 10 (1.018 ~1.449) to demonstrate that there were no independent variables with multicollinearity issues.

The relevant factors associated significantly with cancer screening intentions were behavioral attitude, subjective norms, interest in health, preference for the type of cancer screening, prior experience with cancer screening and prior experience with the National Cancer Screening Program. Cancer screening intentions were higher in those participants with higher behavioral attitudes ($p<0.001$), subjective norms ($p=0.040$) and interests in health ($p=0.004$) and in those who selected both private and the National Cancer Screening Program as the preferred screening types ($p=0.003$). The explanatory power of the model was 37.3% (Table 4).

Table 1. Cancer Screening Intentions and Experience based on the Participants' Characteristics (N=425)

Variables	Classification	n (%)	Cancer screening			Cancer screening intention		
			Yes	No	$\chi^2(p)$	M \pm SD	t or F	p
Sex	Male	142(33.4)	91(30.2)	51(41.1)	4.68 (0.030)	3.87 \pm 0.76	-1.99	0.046
	Female	283(66.6)	210(69.8)	73(58.9)		4.03 \pm 0.74		
age (years)	65-69	129(30.4)	98(32.8)	29(23.6)	8.42 (0.038)	3.99 \pm 0.70	0.78	0.503
	70-79	225(52.9)	158(52.8)	66(53.7)		3.99 \pm 0.79		
	80-89	63(14.8)	40(13.4)	23(18.7)		3.91 \pm 0.66		
	≥ 90	8(1.9)	3(1.0)	5(4.1)		3.63 \pm 0.88		
	Elementary school	233(55.0)	156(52.0)	77(62.6)		4.76 (0.313)		
Middle school	87(20.5)	68(22.5)	19(15.4)	4.08 \pm 0.71				
High school	76(17.9)	56(18.5)	20(16.3)	4.07 \pm 0.66				
College	22(5.2)	16(5.3)	6(4.9)	4.14 \pm 0.71				
>Graduate school	6(1.4)	5(1.7)	1(0.8)	3.94 \pm 0.88				
Job	No	383(90.2)	267(90.2)	116(93.5)	1.22 (0.270)	3.97 \pm 0.75	-0.22	0.823
	Yes	37(8.8)	29(9.8)	8(6.5)		4.00 \pm 0.68		
Monthly income (dollars)	<1000	288(69.9)	197(67.9)	91(74.6)	7.44 (0.190)	3.91 \pm 0.78	1.46	0.201
	1000 ~ 1490	53(12.9)	42(14.5)	11(9.0)		4.04 \pm 0.56		
	1500 ~ 1990	26(6.3)	16(5.5)	10(8.2)		4.12 \pm 0.68		
	2000 ~ 2990	26(6.3)	18(6.2)	8(6.6)		4.12 \pm 0.69		
	3000 ~ 3990	12(2.9)	10(3.4)	2(1.6)		4.05 \pm 0.46		
	≥ 4000	7(1.7)	7(2.4)	0(0.0)		4.43 \pm 0.87		
Marital status	Married	282(66.7)	209(69.7)	73(59.3)	5.00 (0.287)	4.00 \pm 0.72	1.27	0.281
	Widowed	135(31.9)	87(29.0)	48(39.0)		3.91 \pm 0.79		
	Separated	2(0.5)	1(0.3)	1(0.8)		3.83 \pm 0.23		
	Divorced	4(0.9)	3(1.0)	1(0.8)		4.55 \pm 0.77		
Family type	Solitude	105(25.2)	65(22.1)	40(32.8)	21.96 (<0.001)	3.85 \pm 0.77	1.05	0.370
	With spouse	215(51.7)	172(58.5)	43(35.2)		3.99 \pm 0.73		
	With children	91(21.9)	55(18.7)	36(29.5)		4.01 \pm 0.76		
	Etc	5(1.2)	2(0.7)	3(2.5)		4.00 \pm 0.75		

Table 2. Cancer Screening Intentions and Experience According to the Health Behavior and Cancer Screening-Related Characteristics of Participants

Variables	Classification	n (%)	Cancer screening			Cancer screening intention		
			Yes	No	$\chi^2(p)$	M \pm SD	t or F	p
Smoking	Noa	355(83.7)	257(85.7)	98(79.0)	7.27	4.02 \pm 0.73	6.47	0.002
	Smoking cessationb	47(11.1)	33(11.0)	14(11.3)	(0.026)	3.93 \pm 0.79		c<a,b
	Yesc	22(5.2)	10(3.3)	12(9.7)		3.44 \pm 0.69		
Drinking (/week)	No	310(73.5)	229(76.3)	81(66.4)	6.13	4.01 \pm 0.73	2.19	0.089
	\leq 1	64(15.2)	42(14.0)	22(18.0)	(0.105)	3.91 \pm 0.82		
	2~3	39(9.2)	25(8.3)	14(11.5)		3.94 \pm 0.70		
	\geq 4	9(2.1)	4(1.3)	5(4.1)		3.41 \pm 0.70		
Exercise (/week)	Noa	98(23.1)	60(20.0)	38(30.6)	15.84	3.75 \pm 0.80	4.30	0.005
	1~2 ^b	133(31.4)	92(30.7)	41(33.1)	(<0.001)	4.01 \pm 0.73		a<b,c
	3~4 ^c	119(28.1)	100(33.0)	19(15.3)		4.10 \pm 0.71		
	\geq 5	74(17.5)	48(16.0)	26(21.0)		4.00 \pm 0.72		
Perceived health status	Very healthy	20(4.7)	16(5.3)	4(3.2)	4.44	4.19 \pm 0.71	2.78	0.026
	Healthy ^a	122(28.8)	93(31.5)	29(23.4)	(0.350)	4.09 \pm 0.69		a>b
	Usual	181(42.8)	125(41.0)	56(45.2)		3.97 \pm 0.74		
	Unhealthy ^b	86(20.3)	56(19.4)	30(24.2)		3.77 \pm 0.83		
Weight control	Terrribly unhealthy	14(3.3)	9(2.8)	5(4.0)		3.95 \pm 0.60		
	Yes	343(81.1)	258(86.0)	85(69.1)	17.27	4.15 \pm 0.67	10.90	<.001
Interest in health	No	80(18.9)	42(14.0)	38(30.9)	(<0.001)	3.64 \pm 0.87		
	Very high ^a	86(20.2)	64(21.3)	22(17.7)	18.20	4.26 \pm 0.63	12.49	<.001
	High ^b	158(37.2)	120(39.9)	38(30.6)	(0.001)	3.99 \pm 0.70		a>b,c>d
	Usual. ^c	162(38.1)	111(36.9)	51(41.1)		3.91 \pm 0.75		
	Low ^d	17(4.0)	6(2.0)	11(8.9)		2.96 \pm 0.68		
Chronic disease	Very low	2(0.5)	0(0.0)	2(1.6)		4.00 \pm 1.41		
	Yes	268(63.7)	191(64.1)	77(62.6)	0.08	3.92 \pm 0.75	-1.79	0.074
Concerns for cancer	No	153(36.3)	107(35.9)	46(37.4)	(0.772)	4.06 \pm 0.73		
	Very high ^a	82(19.5)	74(24.7)	8(6.6)	22.03	4.24 \pm 0.69	6.45	<.001
	High ^b	195(46.3)	137(45.8)	58(47.5)	(<0.001)	4.00 \pm 0.66		a>c,d
	Usual. ^c	92(21.9)	56(18.7)	36(29.5)		3.74 \pm 0.85		
	Low ^d	26(6.2)	15(5.0)	11(9.0)		3.68 \pm 0.87		
Experience of cancer screening	Very low	26(6.2)	17(5.7)	9(7.4)		4.15 \pm 0.65		
	Yes	300(70.8)	300(70.8)	0(0)		4.15 \pm 0.66	7.55	<.001
Preference of cancer screening type	No	123(29.2)	0(0)	123(29.2)		3.55 \pm 0.78		
	Public	254(60.2)	183(61.2)	71(57.7)	25.73	3.98 \pm 0.77	5.51	0.001
	Private	51(12.1)	37(12.4)	14(11.4)	(<0.001)	3.89 \pm 0.73		a,c>d
	Both	88(20.9)	70(23.4)	18(14.6)		4.17 \pm 0.59		
Perception of the NCSP	Unsure	29(6.9)	9(3.0)	20(16.3)		3.55 \pm 0.84		
	Very high ^a	58(13.6)	52(17.4)	6(5.1)	62.34	4.47 \pm 0.70	14.03	<.001
	High ^b	158(37.2)	126(42.1)	32(27.1)	(<0.001)	4.05 \pm 0.62		a>b,c>d,e
	Usual. ^c	109(25.6)	84(28.1)	25(21.2)		3.95 \pm 0.70		
	Low ^d	66(15.5)	29(9.7)	37(31.4)		3.57 \pm 0.83		
Experience of the NCSP	Very low ^e	25(6.1)	8(2.7)	18(15.3)		3.61 \pm 0.81		
	Yes ^a	253(59.5)	217(73.1)	36(29.8)	70.45	4.17 \pm 0.66	23.36	<.001
	No ^b	131(31.1)	60(20.2)	72(59.5)	(<0.001)	3.67 \pm 0.75		a>b,c
	Unsure ^c	33(7.8)	20(6.7)	13(10.7)		3.72 \pm 0.90		

NCSP : National cancer screening program ; ^{a-d} Post-hoc comparison

Table 3. Cancer Screening Behavior According to TPB Variables (N=425)

Variables	Total (M \pm SD)	Cancer Screening		$\chi^2(p)$
		Yes (n=301) mean \pm SD	No (n=124) mean \pm SD	
Attitude toward behavior	4.19 \pm 0.54	4.27 \pm 0.52	4.03 \pm 0.55	4.13 (<.001)
Subjective norm	4.11 \pm 0.63	4.19 \pm 0.61	3.90 \pm 0.66	4.32 (<.001)
Perceived behavior control	2.97 \pm 0.88	2.84 \pm 0.91	3.27 \pm 0.72	-4.67 (<.001)
Cancer screening intention	3.98 \pm 0.75	4.16 \pm 0.65	3.50 \pm 0.80	7.55 (<.001)

^aTheory of Planned Behavior

Factors influencing cancer screening behavior

The results of the multiple logistic regression performed to investigate the factors influencing the cancer screening behavior of the participants are shown in Table 5. The analysis showed that when the participant did not smoke, exercised three to four times per week, preferred the National Cancer Screening Program or private cancer screening for future cancer screenings, had higher screening intentions and higher perception of the

National Cancer Screening Program, he or she was more likely to undergo cancer screening. Conversely, when the participant was more concerned with cancer, lacked prior experience with the National Cancer Screening Program and had a heightened perception of behavioral control towards cancer screening, the participant was more likely not to undergo cancer screening. Specifically, participants in the non-smoking group were 3.323-fold more likely to undergo cancer screening than those in the smoking

Table 4. Factors Influencing Cancer Screening Intentions (N=425)

Factors	β	SE	t	p
Attitude toward behavior	0.279	0.080	4.853	<0.001
Cancer screening ^a (No)	-0.243	0.078	-5.144	<0.001
Experience of the NCSP ^b (No)	-0.133	0.077	-2.806	0.005
Interest in health	0.128	0.040	2.861	0.004
Preference of cancer screening type ^c (Both)	0.129	0.078	2.985	0.003
Subjective norm	0.119	0.068	2.065	0.040

R² =0.373, F=34.690, p<.001NCSP : National cancer screening program; ^{a-c} The variables were adjusted as a dummy variables**Table 5. Factors Influencing Cancer Screening Behavior (N=425)**

Factors	Cancer screening behavior		
	OR	95% CI	p
Smoking ^a			
Yes	3.32	1.06~10.44	0.040
Exercise ^b			
3-4/week	3.24	1.19~8.83	0.021
Concerns for cancer	0.74	0.56~0.98	0.038
Preference of cancer screening type ^c			
Public	4.99	1.41~17.69	0.013
Private	11.37	2.54~50.95	0.001
Both	4.79	1.21~18.94	0.025
Experience of the NCSP ^d			
No	0.26	0.08~0.85	0.026
Cancer screening intention	2.38	1.49~3.81	0.000
Perception of the NCSP	1.47	1.12~1.94	0.006
Perceived behavior control	0.51	0.34~0.78	0.002

-2 Log likelihood = 288.480

NCSP : National cancer screening program; ^{a-d} The variables were adjusted as a dummy variables

group. Similarly, participants that expressed a preference for the type of cancer screening were 4.795-11.368-fold more likely than those with no preference and participants with higher cancer screening intentions were 2.383-fold more likely than those with lower intentions to undergo cancer screening (Table 5).

Discussion

In the present study, we examined the current cancer screening status and determined the factors influencing the cancer screening intentions and behavior of elderly Koreans. Because cancer screening behavior is influenced by many factors, including individual, sociological and environmental factors, we investigated the TPB variables that account for health behaviors and intentions and sociodemographic, health behavioral and cancer screening-related characteristics of the study population. Furthermore, we distinguished the factors that influence the intentions from those that influence the behavior of cancer screening.

In this study, 70.8% of participants had undergone cancer screening, which was higher than the overall cancer screening rate of 47.8% in 2010 (National Health Insurance Service, 2012). Despite the above results, efforts are necessary to attain the national cancer screening rate goal of 80% by 2020 as presented by the third National Health Promotion Plan.

Because the screening rate varies according to the participants' characteristics, several variables should be considered. In this study, the cancer screening rate of females was significantly higher than that of males, which is consistent with the findings of Lee (2008) and Sung et al. (2005) Gender has been known to influence not only physical and psychological health but also health-related behavior (Valentiny et al., 2012). Therefore, policies that aim to increase the cancer screening rate among the elderly should take gender into consideration. Because cancer incidence rates are statistically higher among males, a specific plan to target males is necessary. Furthermore, those elderly individuals living with partners showed higher cancer screening rates. These results are in agreement with the findings of Lee (2008), which showed that in the elderly spousal concern for health is likely to be greater than in those living alone or with their children. A previous study reported that 54.1% of adults in South Korea preferred receiving cancer screening recommendations from family, friends, or close acquaintances (Kye and Moon 2010), and that social support including cancer screening recommendations from family and close acquaintances was associated with cancer screening behavior (Madlensky et al., 2003; Hahm et al., 2007; Soskolne et al., 2007). Furthermore, Kye and Moon (2010) reported that recommendations received for cancer screening increased the cancer screening rate compared with receiving no recommendations. Thus, using family and social groups is necessary when designing a screening education program. In particular, community welfare and senior citizen centers can facilitate the exchange of information and increase cancer screening interest, because many elderly spend a significant amount of time in these institutions.

The cancer screening rate is reportedly associated with health-related behaviors such as smoking, alcohol consumption and exercise. In the present study, elderly with good health-related behaviors exhibited a higher cancer screening rate, which supports the findings of Lee (2008) and Vedel et al. (2011) and indicates that the cancer screening rate is associated with health-related behaviors and interests. Because encouraging cancer screening in high-risk groups is important, cancer screening is needed in those elderly individuals with unsatisfactory health-related behaviors (Vedel et al., 2011).

Additionally, because elderly individuals with low interest in health exhibited low cancer screening rates, recommendations for cancer screening policies are especially necessary in social classes with low health perceptions. The National Cancer Screening Program covers the cost of cancer screening for individuals who cannot receive cancer screenings for economic reasons. If perceptions regarding such policies are improved, then the cancer screening rates of vulnerable individuals could be increased.

Additionally, considering that periodical behaviors such as cancer screening can easily become a part of a routine once the participants gain experience with them, a consistent increase in cancer screening rates may result. Consequently, when considering cancer screening in the elderly, exploring measures that appropriately improve

the screening rate of the elderly by specifically targeting individuals with low cancer screening rates, including those without family members, health-related behavior and prior experience with cancer screening is necessary.

The influencing factors generally known to affect cancer screening behavior include sociodemographic factors such as age, monthly income, occupation, marital status, education level and health-related behavioral factors such as exercise, smoking and alcohol consumption (Martires et al., 2013; Suh et al., 2013). Similarly, the predictive factors that influenced cancer screening behavior according to this study were smoking, exercise, cancer concerns, preferred type of cancer screening, prior experience with the National Cancer Screening Program, perception of the National Cancer Screening Program, behavioral control with respect to cancer screening and cancer screening intentions.

Intention is the single greatest factor affecting behavior. Furthermore, similar to the present study, Kwak et al. (2005) reported that the strongest factor determining cancer screening behavior is cancer screening intention. Therefore, increasing the cancer screening intentions of the elderly is necessary to raise the rate of cancer screening in this population. The variables that influence cancer screening intention were behavioral attitude, subjective norms, interest in health, preference for the type of cancer screening, prior experience with cancer screening and prior experience with the National Cancer Screening Program. In particular, those with positive behavioral attitudes and higher subjective norms had stronger cancer screening intentions, which is in agreement with the findings of Kim et al. (2010), who identified the TPB variables affecting the screening intentions of National Cancer Screening Program participants. However, various studies related to cancer screening have reported different results. In a study by Halm et al. (2007) on gastric cancer, behavioral attitudes showed a significant influence, whereas subjective norms did not. Similarly, in studies by Steele et al. (2005) on breast cancer and Berglund et al. (2005) on prostate cancer, behavioral attitudes showed a significant influence. Conversely, Tolma et al. (2006) showed that behavioral attitudes were not statistically significant. In the present study, the strongest predictive factor of cancer screening intention was the individual behavioral attitude.

As mentioned above, the significant factors influencing cancer screening behavior and cancer screening intentions were different. Behavioral attitudes significantly influenced cancer screening intentions but were not significantly related to cancer screening behavior. Instead, perceived behavioral control influenced the cancer screening behavior. Perceived behavioral control implies any impediments or feelings that prevent a particular action from being performed. Our results were similar to previous studies have also shown that the discomfort induced during the screening process, anxiety and press for time were factors interfering with the screenings (Lee, 2010) and economic and social problem are barriers against proper cancer screening (Fouladi et al., 2013). Furthermore, a lower perceived barrier was associated with increased cancer screening behavior. Previous studies

have also shown that perceived behavioral control was an influential factor for cancer screening behavior (Drossaert et al., 2003; Honda et al., 2006; Orbell et al., 2006). The group with lower perceived behavioral control showed improved cancer screening behavior, indicating that removing the obstacles to cancer screenings can increase the rates of cancer screening. These results indicate that to transition from cancer screening intention to behavior, changes in behavioral control factors related to cancer screening are necessary.

As demonstrated in this study, a higher perception of the National Cancer Screening Program and cancer screening intention resulted in higher cancer screening rates. These results indicate that marketing and educational efforts are important factors for increasing cancer screening rates. In particular, elderly tend to have less knowledge regarding cancer or learning capacities, and educational content and methods that reflect the appropriate needs of the elderly are necessary. Education and marketing can be conducted at elderly community centers and among other elderly social groups. Consequently, promoting cancer screening programs requires the development of participant-centered marketing and educational measures.

In summary, The predictive factors influencing cancer screening behavior included smoking, exercise, cancer concerns, preference for the type of cancer screening, prior experience with the National Cancer Screening Program, perception of the National Cancer Screening Program, behavioral control with respect to cancer screening and cancer screening intentions. However, the factors influencing cancer screening behaviors were different from those influencing cancer screening intentions. Specifically, behavioral attitude, which significantly influenced cancer screening intentions, had no effect on cancer screening behavior; rather, perception of behavioral control influenced cancer screening behavior. Therefore, increasing the cancer screening intentions of the elderly is necessary prior to increasing their cancer screening rate. In addition, to change screening intentions into actual screening behaviors, investigation of the factors that serve as obstacles to the cancer screening behavior of the elderly is necessary.

References

- Berglund G, Nilsson S, Nordin K (2005). Intention to test for prostate cancer. *Eur J Cancer*, **41**, 990-7.
- Choi SH (2008). The prognostic factors of stomach cancer in the elder. *Busan Med J*, **24**, 333-9.
- Drossaert CH, Boer H, Seydel ER (2003). Prospective study on the determinants of repeat attendance and attendance patterns in breast cancer screening using the theory of planned behavior. *Psychol Health*, **18**, 551-65.
- Fouladi N, Pourfarzi F, Mazaheri E, et al (2013). Beliefs and behaviors of breast cancer screening in women referring to health care centers in northwest Iran according to the champion health belief model scale. *Asian Pac J Cancer Prev*, **14**, 6857-62.
- Hahm MI, Choi KS, Kye SY, Kwak MS, Park EC (2007). Factors influencing the intention to have stomach cancer screening. *J Prev Med Public Health*, **40**, 205-12.
- Honda K, Kagawa-Singer M (2006). Cognitive mediators linking

- social support networks to colorectal cancer screening adherence. *J Behav Med*, **29**, 449-60.
- Hwang SK, Eo YS, Cho YR, et al (2003). A survey on cancer screening among the middle-aged in pusan area. *Korean J Health Edu Promot*, **19**, 132-52.
- Ju HO, Kim JS, Jo YS, et al (2003). A survey on cancer screening among nurses at general hospital in Busan. *Korean J Women Health Nurs*, **9**, 18-27.
- Kim RB, Park KS, Hong DY, Lee CH, Kim JR (2010). Factors associated with cancer screening intention in eligible persons for national cancer screening program. *J Prev Med Public Health*, **43**, 62-72.
- Kim YB, Lee WC, Ro WN, et al (2003). The factors associated with health and cancer screening using preventive programs from health insurance among women of a community. *Korean J Health Edu Promot*, **20**, 41-60.
- Kye SY, Moon IO (2010). Development of analytic model for determinants on the stages of change in colorectal cancer screening. *Korean J Health Edu Promot*, **27**, 79-93.
- Kwak MS, Park EC, Bang JY, et al (2005). Factors associated with cancer screening participation. *J Prev Med Public Health*, **38**, 473-81.
- Lee GY (2010). The related factors of endoscopy examination among health examinees (Dissertation). Busan:Kosin University.
- Lee MS (2008). Comparison of health promotion behavior in middle aged rural residents by cancer screening participation. *J Korean Acad Community Health Nurs*, **21**, 43-52.
- Lee WC (2011). Evidence-based national cancer screening program of Korea. *J Korean Med Assoc*, **54**, 1028-35.
- Madlensky L, Esplen M J, Gallinger S, McLaughlin JR, Goel V (2003). Relatives of colorectal cancer patients: Factors associated with screening behavior. *Am J Prev Med*, **25**, 187-94.
- Martires KJ, Kurlander DE, Minwell GJ, Dahms EB, Bordeaux JS (2013). Patterns of cancer screening in primary care from 2005 to 2010. *Cancer*, **120**, 253-61.
- National Cancer Center (2012). Cancer Facts and Figures 2012. National cancer center: Korea.
- National Health Insurance Service (2012). National Health Insurance Statistical Yearbook. National Health Insurance Service: Korea.
- Oh EJ, Lee YE, Lee SO (2010). Cervical cancer screening behavior and related factors among married women. *J Korean Soc Matern Child Health*, **14**, 12-23.
- Orbell S, Hagger M, Brown V, Tidy J (2006). Comparing two theories of health behavior: A prospective study of noncompletion of treatment following cervical cancer screening. *Health Psychol*, **25**, 604-15.
- Quaglia A, Tavilla A, Shack L, et al (2009). The cancer survival gap between elderly and middle-aged patients in Europe is widening. *Eur J Cancer*, **45**, 1006-16.
- Soskolne V, Marie S, Manor O (2007). Beliefs, recommendations and intentions are important explanatory factors of mammography screening behavior among muslim Arab women in Israel. *Health Educ Res*, **22**, 665-76.
- Statistics Korea (2012). Annual Report on the Causes of Death Statistics. Statistical office: Korea.
- Steele S, Porche D (2005). Questionnaire development to predict mammography intention among women in southeastern Louisiana. *J Nurs Meas*, **13**, 23-37.
- Suh M, Choi KS, Lee YY, Park B, Jun JK (2013). Cancer screening in Korea, 2013: Results from the Korean national cancer screening survey. *Asian Pac J cancer Prev*, **14**, 6459-63.
- Sung NY, Park EC, Shin HR, Choi KS (2005). Participation rate and related socio-demographic factors in the national cancer Screening program. *J Prev Med Public Health*, **38**, 93-100.
- Tolma EL, Reininger BM, Evans A, Ureda J (2006). Examining the theory of planned behavior and the construct of self-efficacy to predict mammography intention. *Health Educ Behav*, **33**, 233-51.
- Vainio H, Bianchini F (2002). IARC Handbook of Cancer Prevention: Breast Cancer Screening. 7th ed.: IARC Press: LYON.
- Valentiny C, Kemmler G, Stauder R (2012). Age, sex and gender impact multidimensional geriatric assessment in elderly cancer patients. *J Geriatr Oncol*, **3**, 17-23.
- Vedel I, Puts M, Monette M, Monette J, Bergman H (2011). Barriers and facilitators to breast and colorectal cancer screening of older adults in primary care: A systematic review. *J Geriatr Oncol*, **2**, 85-98.
- Yang YH (2012). Relationships between knowledge about early detection, cancer risk perception and cancer screening tests in the general public aged 40 and over. *Asian Oncol Nurs*, **12**, 52-60.
- Yoon JL, Roh YK, Kim MY, et al (2009). A research for the development of national health screening program for Korean older persons. hallym university health care service support center: Korea.