

## RESEARCH ARTICLE

# Intrinsic Motivation Factors Based on the Self-Determinant Theory for Regular Breast Cancer Screening

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### Abstract

The purpose of this study was to identify factors of intrinsic motivation that affect regular breast cancer screening and contribute to development of a program for strategies to improve effective breast cancer screening. Subjects were residing in South Korea Gangwon-Province and were female over 40 and under 69 years of age. For the investigation, the Intrinsic Motivation Inventory (IMI) was modified to the situation of cancer screening and was used to survey 905 inhabitants. Multinomial logistic regression analyses were conducted for regular breast cancer screening (RS), one-time breast cancer screening (OS) and non-breast cancer screening (NS). For statistical analysis, IBM SPSS 20.0 was utilized. The determinant factors between RS and NS were “perceived effort and choice” and “stress and strain” - internal motivations related to regular breast cancer screening. Also, determinant factors between RS and OS are “age” and “perceived effort and choice” for internal motivation related to cancer screening. To increase regular screening, strategies that address individual perceived effort and choice are recommended.

**Keywords:** Breast cancer - self-determinant theory - regular screening - intrinsic motivation

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### Introduction

Breast cancer is the most common cancer in women worldwide (Nourazarian et al., 2014). In Korea, the age-standardized incidence rate among 100,000 women in 1999 was 24.5. Recently the age-standardized incidence rate in 2010 was 45.4 and it rose 6.0% ( $p < 0.05$ ) annually. So, it is expected to continue to increase and breast cancer should be interested continually with a high priority (Lee et al., 2010).

Breast cancer is on the rise, but through early detection and early treatment the survival rate of cancer could be improved. The breast cancer can be treated comparatively on the early stage. Especially the 5-year survival rate shows 90~100% for stage 0 (carcinoma) and stage 1, and 30.2% for stage 4 and there is very big difference in survival rate (Korea Breast Cancer Society, 2008). This means that the early detection is very important on the Breast. Also, the early treatment through the early screening is closely related to mental health along physical health. National Cancer Center and the Breast Cancer Society in Korea recommend the breast self-examination every month for women over the age of 30 to prevent breast cancer, physician examination every other year over 35-year-old women and breast examination and mammography every other year over 40-year-old women (National Cancer Information Center, 2012).

Especially, the mammography is the most ideal method because it showed the 90~95% accuracy rate of early

breast cancer diagnosis (National Cancer Information Center, 2012).

Despite these importance, the examination rate every other year over 40-year-women in Korea, 2011 was 60.4%. Compared to other countries, it was lower than 66.6% in US (2009) and 73.7% in UK (2010) also, it was lower than the examination rate of gastric cancer, 64.6% and cervical cancer 62.4 (Ministry of Health and Welfare, 2011).

To use effectively the cancer screening, it is important to get regular screening not one-time screening. That is, through the regular screening with the recommendation, the cancer could be detected at early stage and the early cancer might be found between screenings. So, the mortality rate can be reduced (America Cancer Society, 1992; US Preventive Services Task Force, 1996; Jeong et al., 2004). Several countries have already stressed the importance of regular cancer screening rather than one-time screening and have been interested to increase the early cancer screening rate. So, studies are progressed to make detailed measures (Halabi et al., 2000; Grabler et al., 2012).

The motivation to increase the willingness of individuals for regular cancer screening should be considered. Intrinsic motivation can affect the cancer screening behavior directly or indirectly, but few studies for intrinsic motivation related regular cancer screening behavior performed.

Therefore, this study identifies factors of intrinsic motivation that affect regular breast cancer screening and

contribute to develop strategies to improve regular breast cancer screening.

## Materials and Methods

### Study design

This study seeks to identify factors that affect intrinsic motivation of regular breast cancer screening for the subjects were women over 40 years of the national cancer screening.

### Subjects and data collection

The study examined the breast cancer and the mammography and breast ultrasound for the breast cancer on the National cancer screening program are applied on the 40years and over females. The study selected 40~69 year old women who reside throughout Gangwon-province. The survey was conducted from January 3 to January 16, 2013 for 14 days and the telephone survey method- dialing (RDD Random Digit Dialing)- was used.

The survey for the factors of regular cancer screening was responded by 996 women and no response to intrinsic motivation was excluded.

### Study tool

In this study, questionnaires were composed of one question whether cancer screening within the last two years, one question for regular cancer screening, 15 questions for intrinsic motivation of cancer screening, and 6 questions for demographic characteristics of subjects.

*i)* The behavior of breast cancer screening (dependent variable): The study examined whether or not received within two years based on the time of survey.

For the question “whether did you take the breast cancer screening within the last two years?”, the answer were “yes” for getting examination or “no” for not getting it.

And for a question “do you get cancer screening regularly?” the answer were “yes” or “no”.

Combining two questions, dependent variables examined in this study were defined as follows.

Regular breast cancer screening (RS): Subjects responded that they took the breast cancer screening within the last 2 years and also do regular check-ups.

One-time breast cancer screening (OS): Subjects responded that they took the breast cancer screening within the last 2 years, but did not do regular check-ups.

None breast cancer screening (NS): Subjects without screening experience.

*ii)* Intrinsic motivation for cancer screening: In this study, the intrinsic motivation was measured with the Intrinsic Motivation Inventory (IMI). The IMI was developed to assess participants’ subjective experience related to experimental tasks (Ryan, 1982). The instrument assesses participants’ interest/enjoyment, perceived competence, effort, value/usefulness, felt pressure and tension, perceived choice, and experiences of relatedness while performing a given screening, thus yielding seven subscales. The scale is highly associated with constructs

of motivation for health-related behaviors, including perceived competency for attempting challenging tasks and autonomous treatment engagement (Deci et al., 1994). The higher the score is the higher the motivation for cancer screening.

Interest/enjoyment: Personal subjective feeling to perform cancer screening

Perceived competence: Confidence and satisfaction of their abilities for cancer screening

Effort: Willingness and efforts to attempt cancer screening

Value/usefulness: Subjective giving subjective value and usefulness about performing cancer screening

Pressure and tension: Psychological pressure and fear about performing a specific behavior

Perceived choice and effort: To select a specific action by synchronized with internal factors for cancer screening

Relatedness: Subjective and psychological intimacy to feel about performing a specific behavior

This tool was proved with reliability and validity and reasonable variables were used for purpose and contents of this study.

*iii)* Distribution of demographic characteristics of subjects: Residential area (city, county) of the subjects examined divided by 10 years such as 40s, 50, and 60s and so on. Education level was classified as elementary school or less, middle school, high school, college or above and current marital statuses were unmarried, married and others (divorced, widowed, separated, etc.).

### Data analysis

*i)* Reliability and validity: Validity of intrinsic motivation items were identified with construct validity through factor analysis and Pearson’s Correlation Coefficient was analyzed as a compliant validity. Chronbach’s alpha coefficient was used to analyze the reliability by internal consistency. If Cronbach’s alpha coefficient is 0.6 or more (Figen and Ayfer, 2012), it is generally recognized to get the reliability of the measurement tool. So this study used 0.6 standards. In addition, to verify a factor analysis of research data, KMO (Kaiser-Meyer-Olkin) and Bartlett tests were conducted.

To verify the reliability and validity of Questionnaire used in this study, exploratory factor analysis was conducted by the principal component analysis. For the rotation method, Kaiser Berry max rotation normalization was performed selectively. The number of factors was selected on the basis of the eigenvalues greater than 1. And the commonality-to indicate how the original variables explain as new factors- was deleted as outlier if it falls below 0.5. The factor loading to show the correlation between variables and factors was confirmed above 0.5, and the validity of the concept was obtained. Through factor analysis, internal motivation factors were selected on the basis of the median and it was converted into the index and each factor was categorized with “high” and “low.”

*ii)* Distribution of demographic characteristics of subjects: Frequency analysis and univariate analysis were performed for the overall grasp of the survey questions.

To examine Demographic characteristics, whether the cancer screening or not and internal motivation related to cancer screening, the frequency analysis was conducted. To examine the distribution of internal motivation, demographic characteristics and cancer screening, the Chi-square test was used for univariate analysis.

The dependent variable, breast cancer screening in the dependent variable was consisted of 3 items-RS, OS and NS. It was analyzed with non-linear regression analysis of the multinomial logit model.

Through this analysis, the internal motivation factors to affect breast cancer screening were ultimately examined.

The data collected in this study were analyzed with the IBM SPSS 20.0 program.

## Results

### Demographic characteristics and cancer screening type

The average age of subjects was 52.3 years old. For the marital status, there were single 1.3%, married 93.0% and other 5.6%. For the education, there were graduated from primary school 15.4%, graduated from middle school 16.0%, high school graduate 37.5% and university above 31.2%, respectively. Also, there were subjects of immediate family members of cancer patients 25.9% and subjects of non-immediate family members 74.1% (Table 1).

76.2% of subjects took breast cancer screening regularly every two years. For the Chi-square test analysis, the factors affecting regular breast cancer screening were confirmed age ( $p < 0.0001$ ), and education level ( $p = 0.013$ ).

Specifically discussed, there were 46.6% for 40s, 31.0% for 50s, and 22.4% for 60s in NS. In OS, there were 58.6% for 40s, 24.2% for 50s, and 17.2% for 60s. In RS, there were 32.9% for 40s, 39.0% for 50s, and 28.1% for 60s in order. In addition, in NS there were 7.8% for elementary school graduation, 12.9% for middle school graduation, 47.4% for high school graduation and 31.9% for college graduation. In OS there were 90.1% for elementary school graduation, 13.1% for middle school graduation, 41.4% for high school graduation and 36.4% for college graduation. In RS there were 17.5% for elementary school graduation, 17.0% for middle school graduation, 35.2% for high school graduation and 30.3% for college graduation. There were no significant differences in annual income, marital status, and family history of cancer and the distribution of breast cancer screening (Table 1).

### Analysis of internal motivation

Cronbach's alpha, the reliability of 19 questionnaires was ranged from 0.663 to 0.886. Therefore, the reliability of the tool used in this study was confirmed. For the verification of KMO and Bartlett, the sample suitability of KMO was 0.903 and it showed very high. Bartlett appeared significantly smaller than 0.0001. The data of this study could be applied to the factor analysis.

Factor analysis of internal motivation is shown in Table 2. 5 factors were summarized among all 19 questions. The factor loading of each factor was 0.5 or more, and the questions were identified to measure the same concept. Therefore, the validity of concept construction could be obtained sufficiently. Each factor

**Table 1. Descriptive Demographic Statistics and Univariate Analysis (Chi-Square and T-Test)**

	Breast Cancer Screening			Total	Chi-square (p-value)
	NS	OS	RS		
Total	116 (12.8%)	99 (10.9%)	690 (76.2%)	905	
age (yr)					
40 ~ 49	54 (46.6%)	58 (58.6%)	227 (32.9%)	339 (37.5%)	29.083 (< 0.0001)
50 ~ 59	36 (31.0%)	24 (24.2%)	269 (39.0%)	329 (36.4%)	
60 ~ 69	26 (22.4%)	17 (17.2%)	194 (28.1%)	237 (26.2%)	
Marital status					
Unmarried	2 (1.7%)	3 (3.0%)	7 (1.0%)	12 (1.3%)	4.169 (0.384)
Married	107 (92.2%)	93 (93.9%)	642 (93.0%)	842 (93.0%)	
Separated/Divorced/Be bereaved	7 (6.0%)	3 (3.0%)	41 (5.9%)	51 (5.6%)	
Educational level					
≤Completed primary school	9 (7.8%)	9 (9.1%)	121 (17.5%)	139 (15.4%)	16.065 (0.013)
Completed middle school	15 (12.9%)	13 (13.1%)	117 (17.0%)	145 (16.0%)	
Completed high school	55 (47.4%)	41 (41.4%)	243 (35.2%)	339 (37.5%)	
≥Completed college	37 (31.9%)	36 (36.4%)	209 (30.3%)	282 (31.2%)	
Familial diagnosis of cancer					
Yes	27 (23.3%)	29 (29.3%)	178 (25.8%)	234 (25.9%)	1.014 (0.602)
No	89 (76.7%)	70 (70.1%)	512 (74.2%)	671 (74.1%)	
perceived usefulness and importance					
Low	63 (54.3%)	60 (60.1%)	323 (46.8%)	446 (49.3%)	7.937 (0.019)
High	53 (45.7%)	39 (39.4%)	367 (53.2%)	459 (50.7%)	
perceived choice and effort					
Low	69 (59.5%)	66 (66.7%)	310 (44.9%)	445 (49.2%)	22.031 (< 0.0001)
High	47 (40.5%)	33 (33.3%)	380 (55.1%)	460 (50.8%)	
perceived interest and relatedness					
Low	74 (63.8%)	72 (72.7%)	392 (56.8%)	538 (59.4%)	10.139 (0.006)
High	42 (36.2%)	27 (27.3%)	298 (43.2%)	367 (40.6%)	
Low	72 (62.1%)	56 (56.6%)	333 (48.3%)	461 (51.0%)	8.984 (0.011)
High	44 (37.9%)	43 (43.4%)	357 (51.7%)	444 (49.0%)	
pressure and tension					
Low	59 (50.9%)	64 (64.6%)	404 (58.6%)	527 (58.2%)	4.294 (0.117)
High	57 (49.1%)	35 (35.4%)	286 (38.8%)	378 (41.8%)	

RS: Regular breast cancer screening; OS: One-time breast cancer screening; NS: None breast cancer screening

was named “perceived effort and choice,” “perceived importance and usefulness,” “perceived relevance and interest,” “perceived competence,” and “pressure and stress” (Table 2).

*Factors associated with regular breast cancer screening*  
To examine how demographic characteristics, internal

motivation related to cancer screening affect regular breast cancer screening, the results of multinomial logistic regression analysis are as follows: (Table 3). -2Log likelihood was 733.18, which showed statistically significant. So, it was suitable model to estimate the causal relationship between explanatory variables and the dependent variables selected in this study. (Oh et al.,

**Table 2. Result of Factor Analysis**

Factor Questions	Factor Loading					Commonality
	1	2	3	4	5	
Perceived importance and usefulness						
I think cancer screening is an important activity.	0.864					0.819
I think cancer screening is important to do because it can healthy.	0.862					0.827
I think that doing cancer screening is useful for health.	0.799					0.777
It was important to me to do well at cancer screening.	0.647					0.605
I believe cancer screening could be of some value to me.	0.583					0.686
Perceived effort and choice						
I put a lot of effort into cancer screening.		0.743				0.778
I tried very hard on cancer screening.		0.729				0.75
I did cancer screening because I wanted to.		0.726				0.706
I did cancer screening because I had to.		0.718				0.756
I felt like I had to do cancer screening.		0.637				0.635
Perceived relevance and interest						
I feel close to cancer screening.			0.821			0.771
It is likely that cancer screening could become establish further acquaintance if I had regularly screened for cancer.			0.789			0.739
Cancer screening was pleasure to do.			0.655			0.612
While I was doing cancer screening, I was thinking about how much I enjoyed it.			0.635			0.599
Perceived competence						
After I was cancer screening, I feel like I am very competent.				0.711		0.591
I am satisfied with my performance at cancer screening.				0.539		0.633
I think I am pretty good at cancer screening.				0.52		0.593
Stress and strain						
I felt pressured while doing screened for cancer.					0.888	0.803
I felt very tense while doing cancer screening					0.825	0.769
Cronbach's alpha	0.895	0.865	0.772	0.683	0.711	
% of variance explained	21.67	18.198	12.428	9.87	8.615	
cumulative % of variance	21.67	39.867	52.295	62.165	70.779	
The scale of Kaiser-Meyer-Olkin				0.91		
Bartlett's test of sphericity				< 0.0001		

**Table 3. Adjusted Predictors of Regularly Cancer Screening**

Variable (base value)	categories	NS		OS	
		Odds ratio (95%CI)	P-value	Odds ratio (95%CI)	P-value
age					
(60 - 69)	40 ~ 49	1.466 (0.775, 2.774)	0.239	3.024 (1.450, 6.306)	0.003
	50 ~ 59	0.912 (0.493, 1.687)	0.769	1.041 (0.501, 2.161)	0.915
Marital status					
(Separated/Divorced /Be bereaved)	Unmarried	0.882 (0.134, 5.801)	0.896	2.673 (0.381, 18.740)	0.322
	Married	0.442 (0.173, 1.128)	0.088	1.008 (0.279, 3.639)	0.99
Educational level					
(≥Completed college)	≤Completed primary school	0.489 (0.198, 1.204)	0.12	0.875 (0.341, 2.244)	0.781
	Completed middle school	0.767 (0.357, 1.644)	0.495	1.371 (0.622, 3.024)	0.434
	Completed high school	1.52 (0.919, 2.513)	0.103	1.359 (0.792, 2.330)	0.265
Familial diagnosis of cancer					
(no)	yes	0.937 (0.577, 1.520)	0.791	1.179 (0.709, 1.960)	0.526
perceived usefulness and importance					
(low)	high	1.122 (0.662, 1.901)	0.668	0.839 (0.473, 1.488)	0.547
perceived choice and effort					
(low)	high	0.535 (0.311, 0.920)	0.024	0.458 (0.250, 0.839)	0.012
perceived interest and relatedness					
(low)	high	0.9 (0.570, 1.422)	0.652	0.645 (0.387, 1.073)	0.091
perceived competence					
(low)	high	0.641 (0.389, 1.056)	0.081	1.141 (0.681, 1.914)	0.616
stress and strain					
(low)	high	1.691 (1.086, 2.633)	0.02	1.05 (0.643, 1.712)	0.846

RS: Regular breast cancer screening; OS: One-time breast cancer screening; NS: None breast cancer screening. Reference category: compared to OS



2006; Pearson et al., 2009).

The RS category was used as the referent category. The first column is the results for comparison between RS and NS. There were no significant factors affecting on NS among demographic characteristics. On the other hand, among the factors of intrinsic motivation, "perceived choice and effort" and "stress and strain" had significant effects on cancer screening. In other words, the higher level of "perceived choice and effort" is the lower possibility of "non-screening group". The group with higher level of "stress and strain" had the greater possibility of NS group-1.691 times, respectively. The second column is the results of comparison between RS and OS. Among demographic characteristics, the significant factor of affecting on OS was age. On 40s, the possibility of OS increased more compared to RS. In other words, 40s had lower rate of RS than OS. Among Intrinsic motivation factors, "perceived choice and effort" had a significant impact on cancer screening. The higher level of "perceived choice and effort" showed 0.458 times lower for one-time screening group rather than for regular screening group ( $p < 0.05$ ) (Table 3).

## Discussion

This study examined for breast cancer and was carried out to find out the factors to affect on RS of every other year in women 40 year. In this study, the rate of RS was 76.2%. This finding was higher than 60.4% from the national cancer center, 52.0% from Key (2012) studied and 60.3% from Lee et al. (2010) studied, which was targeted to married nurses. The subjects of this study were 40s, who had the highest rate of early screening rate for breast cancer from existing researches, were mostly married and had high annual income.

On the other hand, the previous studies proposed that the family history was a significant factor of regular screening for breast cancer (Park et al., 2004; Lee et al., 2010). But, this study found that it was not a significant factor. Many studies insisted that the Family history of breast cancer had odds ratios of breast cancer - 7.9 times on the primary relationships and twice on primary and secondary relationships (Park et al., 2004; Yi, 2006).

By multinomial logistic regression analysis, it showed that the important factor of intrinsic motivation to identify regular cancer screening was "perceived efforts and choice." This indicated that cancer screening would be sustainable habits when individuals have confidence to select cancer screening by self-willing based on the recognition of the importance for breast cancer screening, and individuals could make efforts to get screening.

This could be understood that individual willing was important on the health behavior of cancer screening. In addition, regular screening of breast cancer should be at least two times within 4 years, and the behavior of cancer screening should be habitual.

Leong et al. (2012)- focused on the healthy eating behaviors on 40s~50s women-insisted that the stronger the tendency connected with the intrinsic value targeted behavior, the more positive changes for healthy eating behavior. Also, Seo and Choi (2011) provided that

specific behaviors were determined by the individual intrinsic value, were selected and it was given motivation autonomously. When the autonomous motivation was high, the healthy behavior was connected with regular habits.

Deci and Ryan (2000) explained that the key of the self-determination theory was "the degree to which people endorse their actions at the highest level of reflection and engage in the actions with full sense of choice." This proved that intrinsic interest in the activity reflected one's own will and individual experiences of self-motivation to select for oneself affected the formation of regular habits (Marmot, 2000; Cunningham et al., 2007; Spigner et al., 2007; Kymberlee, 2012).

The significant variables to predict RS and NS were "stress and strain" associated with cancer screening. The fear and negative psychological factors of cancer screening could be interpreted to interfere with cancer screening behaviors and this was similar to the previous studies that persons of cancer screening were less aware of barriers of cancer screening than persons of NS (Kim et al., 2003; Lee et al., 2010). In addition, this was similar to the previous studies; Yang (2012) said that the reason of non-screening was the process of screening will be difficult and painful. Choi et al. (2001) said that perceived barriers were the most significant factor to health promotion behaviors. In the future, the fear and negative psychological factors should be examined in more detail, and the strategies to reduce the negative factors on the health promotion program and advertisements related to cancer screening should be considered.

The significant variables to predict RS and OS were the demographic variable-age. Compared to 40s, 50s had higher rate of regular screening. This showed same results as Jeong et al. (2004) and Choi et al. (2001) -they said that 50s had higher rate of screening than 40s. The older on 50s compared to 40s, the more economic and timely spare. In addition, considered that the percentage of the economic production population concentrated in 40s (Statistics Korea, 2010), the reasons of non-screening was "no time to screening," which was known as the most reason of non-screening. 40s had lower screening rate than 50s due to the absence of enough time (Yang, 2012). The incidence of breast cancer in Korean women have increased rapidly after 40 years old (Ministry of Health and Welfare, 2011), and the promotion and education of regular screening of breast cancer should be much needed. Therefore, it is necessary to increase the regular screening rate through the approaches of modifiable factors based on the reasons of non-screening for each age.

Currently Korea has increased the incidence of breast cancer, with awareness of the importance of early detection of breast cancer, and various private and state-wide are making efforts for the prevention of breast cancer. However, mostly related education program were lectures and promotional material placed in a simple way (Kim and Park, 2011), and the systematic approaches should be needed considering subjects and a variety of approaches. The next regular preventive programs for improving cancer screening rates will be needed to be discussed, taking into account its content and the individual internal

motivation.

In conclusion, this study identified the internal motivation factors affecting on regular screening of breast cancer. The determinant factors between regular screening and non-screening were “perceived effort and choice” and “stress and strain” about breast cancer screening. Also, the determinant factors between regular screening and one-time screening were “age” and “perceived effort and choice”. To change from non-screening into regular screening, internal motivation with efforts to resolve barriers related to stress and strain of cancer screening should be needed. Thus, two factors are required to include positively on the health promotion program and education for non-screening group. In one-time screening 40 years old who had lower efforts, willingness and interest related to screening rather than regular screening group.

Based on the results, to maintain cancer screening continuously, it is necessary to focus on strengthening factors of internal motivation- to emphasize the individual’s willingness rather than emphasizing obligation of cancer screening.

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