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Development and Effect of the Cancer Prevention Education Program Using Different Media

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ABSTRACT

Purpose: *This study was intended to develop and evaluate the cancer prevention education for general population with different educational media such as booklets, cartoons, web frame comic strips, web flash animation and flash animations on personal digital assistants (PDA).* ***Methods:*** *A total of 125 subjects were divided into 5 groups, each group having 25 members and assigned a different educational media. An educational media was assigned to each group to evaluate the effect of education in the first intervention. In the second intervention, 4 other media, excluding the previously used one, were used to educate the subjects and find out the preferences of educational media.* ***Results:*** *Knowledge about cancer increased significantly after cancer prevention education. They preferred animations on the internet to other media, the highest.* ***Conclusion:*** *Educational programs with various media should be developed for subjects to choose based on their preferences.*

Key words*: Cancer, Education, Media, Knowledge.*

1. INTRODUCTION

1.1 Necessity of the Study

Since 1983, cancer has been the leading cause of death which threatens the public health. According to the 2008 annual report on the cause of death, the total number of deaths in Korea was 255,403. Of them, 72,046 cases (28 % of the total death) died from cancer (malignant neoplasm) [1]. Cancer has been known as a disease with its medical expense higher than that of any other. For the scope of medical expenses for cancer in Korea, the number of the cancer patients who were treated under medical insurance(health insurance and medical benefits) in 2011 was 2,596,121 subjects and the medical expenses required for the cancer treatment were a total of 8.76 trillon won with the exception of the uninsured benefit(selecting treatment, ultrasonography, extra charge for the private room) [2]. Accordingly, this means that the economical burden caused by cancer is severe. The increase of the cancer incidence and death rate causes not only loss of human resources but also economical loss from the decreased productivity. Also, cancer patients and their family members are severely damaged both spiritual and material[3]. To decrease those burdens from cancer, the government provides services for cancer control, cancer prevention, cancer screening, home health care for cancer patients, hospice care for late-stage cancer patients, financial support for medical expenses for cancer patients, support and promotion of local cancer centers, and national cancer information center as cancer management projects.

To succeed in these cancer-related projects, they should provide correct information about cancer prevention and cancer screening for cancer patients and their family as well as for local communities, and promote recent information related to cancer management and national support. With the advanced information and communication technology, Korea has been equipped with a technical environment where people can timely receive the required health care information. Therefore, if these situations are used in full, authorities concerned can fast and accurately spread and promote the information about

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diseases and health at public issue by means of diverse media(Cell-phone, PDA, Internet)[4].

Many cancer patients and adults in America search health information on Internet[5], and to meet their needs, the United States National Cancer Institute(NCI) furnishes the required information to cancer patients and their family members through its website[6]. However, Korea's education program which systematically furnishes the information about cancer remains very insufficient. And because most of the furnished information has been written, those who lack general knowledge about diseases and health or those who are not good at written articles have many difficulties in understanding and using the information.

Health and Heath care information should be developed, and diffused from researchers, students, policy-makers to patients, their protectors and general people in accordance with a respective user's level [4]. To meet the above-mentioned matters, various kinds of contents including 'sound' or 'animation' should be developed by using the advanced media, in addition to the existing ways such as booklets and pamphlets. It is, therefore, necessary that information(or contents) should be furnished by a process which users like the most[7]. It has been known that generally, people remember 10% of the learned content when they just read prints or leaflets, 20% when they just listened to the information through a cassette tape recorder, or an audio cassette, 30% when they saw pictures or paintings, and 50% when they watched images through video, or moving pictures[8]. As information technology improves, today, various kinds of educational materials and methods are being developed.

For the fields of health and medical treatment, educational materials in the past were mainly booklets or pamphlets, but recently video materials[9], [10] and moving pictures on the Internet[11] and e-learning programs[12] have been developed and utilized.

Education is most effective when it is offered in a method its subjects want[13]. However, Korea is deficient in both the variety and the data of educational materials. Studies on the educational material which subjects want are also insufficient.
This research team thinks it necessary to build up a health-care system where the public can get information through the educational material they want by developing educational programs using phrases, cartoons and animation for booklets, Internet and PDA.

1.2 Purpose of the study

The purpose of this study is to develop educational programs for cancer prevention into forms of phrase, cartoon and animation and to grasp their effectiveness and subjects' preference for educational media by inserting them in 3 kinds of media such as a booklet, Internet and Personal digital assistant(PDA). The detailed purposes are as follows;

1) To understand the differences of the present and past educational programs for cancer prevention.
2) To analyze the differences of subjects' knowledge about cancer among different educational media after carrying out the educational program for cancer prevention.
3) To grasp subjects' preference for the educational media.

1.3 Definition of terminology

1.3.1 Booklet: This means the same type as an ordinary book that most of educational contents are written. Pictures are provided only to help understand the contents better.

1.3.2 Cartoon: This is the same type as an ordinary cartoon book where most of educational contents are drawn. Each page consists of 6 pictures.

1.3.3 Web frame comic strips: The above-mentioned cartoons are uploaded to a website for Internet-users to see through web search.

1.3.4 Web flash animation: This is the cartoon animated by using flash and an audio application.

1.3.5 PDA animation: This is the PDA-loaded flash animation.

2. METHODOFSTUDY

2.1 Subject of the study

In this study, those who understand the purpose of study and agree to participate in it have been selected as subjects, and also, in order to control the effect of the subjects' features on the education, the subjects have been assigned to groups of educational media (booklet, cartoon, web frame comic strips, web flash animation, and PDA animation) in a match-making way according to their sex, age and educational level.

Cohen's Power Sample Size was used to select the number of subjects[14]. When the level of significance is 0.05, the number of group is 5, effect of size is 0.4, and power of test is 0.8, the number of the subjects may be 16 persons in a group. However, we selected 25 subjects in a group, considering dropouts. A total of 125 persons were selected as the subjects in this study. The standardized subject is a person who is over the age of 20 without any cognitive or mental disorder, graduated from at least middle school, reading the Korean alphabet, understanding the educational content and questionnaire, and thus being able to answer a questionnaire for himself/herself before and after carrying out the education.

2.2 Research design

This study is a nonequivalent control group pretest-posttest design where the educational programs for cancer prevention were developed into 5 kinds of educational media and then subjects' knowledge obtained from those media before/after carrying out the education was analyzed in order to estimate their effectiveness(Fig. 1).

Group \ Period	Pre-test		1st post-test		2nd post-test
Booklet	O_1 *	X_1 §	O_2 †	X_2 ‖	O_3 ‡
Cartoon	O_1 *	X_1 §	O_2 †	X_2 ‖	O_3 ‡
Web frame comic strips	O_1 *	X_1 §	O_2 †	X_2 ‖	O_3 ‡
Web flash animation	O_1 *	X_1 §	O_2 †	X_2 ‖	O_3 ‡
PDA	O_1 *	X_1 §	O_2 †	X_2 ‖	O_3 ‡

* O_1 : General characteristics, Knowledge of cancer
† O_2 : Knowledge of cancer
‡ O_3 : Preferences of education media
§ X_1 : Education using the assigned education media
‖ X_2 : Education using 4 alternative education media

Fig. 1. Research design

2.3 The process of development for the program

This research team made the educational program contents for cancer prevention into phrases, cartoons and animation for the purpose of booklet, Internet and PDA. The process of 4 phases was developed for the educational program.

2.3.1The first phase: team organization for contents: The development team for bio-medicine and medical treatment was organized in the Information and Development Center for Bio-knowledge Foundation of Chungbuk National University. Its members have been composed of doctors, nurses, cartoonists and computer-related experts.

2.3.2 The second phase: development of contents details: The team developed a questionnaire about cancer-related knowledge by consulting documentary records and made a preliminary survey in order to select contents details related with the education for cancer prevention. The details of the contents were developed on the basis of the contents extracted from the preliminary survey result and the inquiry of documentary records. The contents were composed of 10 chapters: Chapter 1 A definition of cancer, Chapter 2 DNA and a gene, Chapter 3 DNA and cancer, Chapter 4 Immune function and cancer, Chapter 5 Characteristics of cancer cell, Chapter 6 A malignant tumor and a benign tumor, Chapter 7 Symptoms of cancer, Chapter 8 Stadium of cancer, Chapter 9 Treatment of cancer and Chapter 10 Prevention of cancer.

2.3.3 The third phase: production of contents" The selected contents have been developed into a booklet. And then, on the basis of this booklet, a cartoonist drew pictures. The completed cartoon has been developed into animation, using Flash. Thus, three educational contents have been completed. After 50 adults over the age of 20 were made to use all of booklet, cartoon and animation, their satisfaction, inconvenience and other opinions about each educational material were surveyed, and based on the result, the contents were finalized after retouching and supplementing.

2.3.4 The fourth phase: use of contents: To raise the use of contents after completing them, the phrases were published into a booklet, cartoon and animation were registered to the Internet by a computer expert, and also the animation was input to a folder of contents of PDA for research(Fig.2).

Using the 5 developed contents(booklet, cartoon, web frame comic strips, web flash animation, and PDA animation), education for cancer prevention was carried out and uploaded to the website of Chungbuk National University.


Web fame comic strips


Web flash animation

Fig. 2. Example of education media.

3. METHODOFSTUDY

3.1 Means of study

3.1.1Knowledge of cancer: 2 doctors and 1 nurse developed a questionnaire about the knowledge of cancer based onboth the questionnaire used in a phase of preliminary survey prior to program development and the contents of educational program for cancer prevention. The validity of the developed questionnaire was confirmed by an oncologist and an oncology certified nurse. The questionnaire has 10 questions, and each answer has 'Yes', 'No', and 'don't know'. In this study, Cronbach's alpha of the questionnaire on the knowledge of cancer was 0.794. A right answer was allotted 1 mark, and a wrong answer and 'don't know' were allotted0 mark. The mark range of knowledge cancer is from the minimum 0 mark to the maximum 10 marks, meaning that the higher the mark is, the higher the knowledge is.

3.1.2Preferred form of educational media: The preference of educational media, after 5 educational media were executed, was examined in a way of marking the educational mediathe subject likes best in an answer to the question "If you have the cancer education by one of the 5 educational media, which do you like the most?"

3.2 Collection of data

The data of this study were collected by a way of interview for two months from April 1st to May 31st in 2006. The prior survey (general features and knowledge of cancer) was conducted before the education for cancer prevention was done. In the first ex post facto survey(the knowledge of cancer), the knowledge of cancer was measured directly after education by means of the assigned educational media was done; in the second ex post facto survey, the preference of media was inquired after education with 4 kinds of unassigned educational media was done. Subjects who were told the purpose and method of the study before data collection and agreed to join the study were made to write 'a letter of agreement for participation' in their own handwriting. Researchers were told

that they could stop the research and cancel participation in the study at anytime when they wanted during the research. Also they were told that the data would not be used for other purposes except the study itself and would be kept confidential because all data were treated anonymously. Data collection was carried out by a researcher and a supplementary member. They helped subjects use the media and proceed the study, but questionnaires were drawn up strictly by subjects only.

3.3 Analysis of data

The homogeneity of subjects' general features was examined through a crosstabulation analysis; the homogeneity of knowledge of cancer was analyzed with analysis of variance(ANOVA). The difference of knowledge of cancer before/after the education of media as a group was analyzed with Paired t-test; the difference of knowledge of cancer among groups after the media education was analyzed with ANOVA.

The subjects' preference for educational media was analyzed with the frequency, and percentage; the preference of educational media in accordance with the age was analyzed through a crosstabulation analysis.

4. RESULT

4.1 Homogeneity of study participants

Shown is the result of the examination of homogeneity of subjects' general features in each group of educational media(Table 1). For the age, subjects at the age of 20-30 formed the largest part, more than 50% of the whole in all 5 groups of media; subjects at the age of 40-59 and over the age of 60 showed their homogeneity in the following order(χ^2=6.89, p=.549).

For their academic background, the subjects graduated from at least a technical college(2-year system) formed the largest part, about 50% of the whole in all 5 groups of media; subjects graduated from lower than middle school and high school showed their homogeneity in the following order(χ^2=13.14, p=.662).

For monthly income, 1,000,000-1,990,000 won formed the largest part, 44% of the whole in the booklet group; in groups of cartoon, web flash animation and PDA animation, the income more than 2,000,000 won formed the largest part; in web frame comic strips, the income less than 1,000,000 won formed the largest part, 48% of the whole. However, as they had little significant difference statistically, they were shown to be homogeneous (χ^2=13.63, p=.092).

For the ways to obtain health information, broadcast formed the largest part, 50% of the whole, in all 5 groups of educational media. As they had little significant difference statistically, they were shown to be homogeneous (χ^2=17.14, p=.376).

As for the result of the examination of homogeneity on knowledge of cancer, cartoon of 5 educational media groups got the highest 6.46 marks, followed by web flash animation group with 6.28 marks, booklet with 5.92, web frame comic strips with 5.44, and lastly PDA animation with 5.4. However, as they had little significant difference statistically, they were shown to be homogeneous(F=0.98, p=.421).

4.2 The difference in the knowledge of cancer before and after education.

As for the research result of knowledge of cancer before/after carrying out the education in accordance with educational media (Table 2), booklet group showed knowledge increase from 5.92 before education to 8.12 after education, which, statistically, had significant difference (t=-4.88, $p < .001$); cartoon group from 6.46 before education to 7.88 after education, which, statistically, had significant difference (t=-4.2, $p < .001$).

Table 1. Homogeneity of General Characteristics and Knowledge of Cancer Score (N=125)

General Characteristics		Booklet	Cartoon	Web Frame Comic Strips	Web Flash Animation	PDA *	χ^2	p
		n(%)	n(%)	n(%)	n(%)	n(%)		
Age(years)	20-39	13(52.0)	13(52.0)	13(52.0)	14(56.0)	13(52.0)	6.89	.549
	40-59	8(32.0)	8(32.0)	5(20.0)	5(20.0)	5(20.0)		
	≥60	4(16.0)	4(16.0)	7(28.0)	6(24.0)	7(28.0)		
Education	≤Middle school	7(28.0)	6(24.0)	8(32.0)	9(36.0)	7(28.0)	13.14	.662
	High school	6(24.0)	6(24.0)	3(12.0)	2(8.0)	4(16.0)		
	≥college	12(48.0)	13(52.0)	14(56.0)	14(56.0)	14(56.0)		
Income per Month (10,000won)	≤100	4(16.0)	7(28.0)	12(48.0)	5(20.0)	5(20.0)	13.63	.092
	100-199	11(44.0)	4(16.0)	6(24.0)	9(36.0)	6(24.0)		
	≥200	10(40.0)	14(56.0)	7(28.0)	11(44.0)	14(56.0)		
Acquisition of Health Information	medical personnel	2(8.0)	4(16.0)	3(12.0)	4(16.0)	4(16.0)	17.14	.376
	printed matter	2(8.0)	4(16.0)	1(4.0)	2(8.0)	2(8.0)		
	broadcast	12(48.0)	13(52.0)	16(64.0)	12(48.0)	13(52.0)		
	internet	6(24.0)	1(4.0)	3(12.0)	0(0.0)	4(16.0)		
	neighborhood	3(12.0)	3(12.0)	2(8.0)	7(28.0)	2(8.0)		
General Characteristics		Booklet	Cartoon	Web Frame Comic Strips	Web Flash Animation	PDA *	F	p
		Mean±SD	Mean±SD	Mean±SD	Mean±SD	Mean±SD		
Knowledge of Cancer (scor)		5.92±2.55	6.46±2.13	5.44±2.77	6.28±2.2	5.40±2.84	0.98	.421

* PDA = personal digital assistant.

Table 2. Differences of Knowledge of Cancer (N=125)

The Assigned Education Media	Pre test Mean±SD	Post test Mean±SD	Difference (Before-After) Mean±SD	Paired t	*p*	F	*p*
Booklet	5.92±2.55	8.12±1.33	-2.20±2.25	-4.88	< .001	.38	.824
Cartoon	6.46±2.13	7.88±1.03	-1.42±1.67	-4.17	< .001		
Web Frame Comic Strips	5.44±2.77	7.84±1.55	-2.40±1.91	-6.27	< .001		
Web Flash Animation	6.28±2.21	7.64±2.06	-1.36±2.45	-2.78	.010		
PDA *	5.40±2.84	8.04±1.43	-2.64±2.52	-5.96	< .001		

* PDA = personal digital assistant.

Table 3. Preferences of Education Media by the Ages (N=125)

Education Media	Total	20-39	40-59	60 over	χ^2	*p*
		n(%)	n(%)	n(%)		
Booklet	15(12.0)	4(6.1)	7(21.2)	4(15.4)	13.28	.103
Cartoon	30(24.0)	15(22.7)	7(21.2)	8(30.8)		
Web Frame Comic Strips	27(21.6)	13(19.7)	5(15.2)	9(34.6)		
Web Flash Animation	35(28.0)	23(34.8)	8(24.2)	4(15.4)		
* PDA	18(14.4)	11(16.7)	6(18.2)	1(3.8)		

* PDA = personal digital assistant.

The knowledge of web frame comic strips group increased 5.44 before education to 7.84 after education, which, statistically, had significant difference(t=-6.27, $p < .001$);that of web flash animation group from 6.28 before education to 7.64 after education, which, statistically, had significant difference(t=-2.78, $p=.010$);that of PDA animation group from 5.40 before education to 8.04 after education, which, statistically, had significant difference(t=-5.96, $p < .001$).

4.3 The difference in the knowledge of cancer after education with the different forms of educational media

As for the result of analysis on the difference of the knowledge of cancer among educational media before/after education, PDA animation group was the highest -2.64; web frame comic strips group was -2.40; booklet group was -2.20; cartoon group was -1.42; web flash animation was -1.36. These 5 groups had, statistically, little significant difference (F=0.38, $p=.824$).

4.4 Educational media preferences

To grasp the preference for the educational media, subjects were requested to choose the media they liked the most after educating them using the 5 educational media. The result is as follows: The media of the highest preference was web flash animation and the followings were cartoon, web frame comic strips, PDA animation and booklet in order. As for the result of analysis on the preference for educational media in accordance with the age, subjects at the age of 20-39 and 40-59 preferred web flash animation, while those over the age of 60 preferred cartoon. Accordingly, age had little significant difference(χ^2=13.28, $p=.103$) (Tab.3).

5. DISCUSSION

Cancer causes serious health problems in itself. In addition, as various kinds of treatments such as surgical therapy, chemotherapy, gene therapy, radiation therapy and immunotherapy are used along with one another, cancer patients experience severe pain from the uncertainty about the prognosis of disease and side effects of treatment [15]. Therefore, the government needs to build up systematic educational programs and information-furnishing systems which can provide cancer screening services, support cancer patients, and prevent cancer. This study, after developing the educational program for cancer, made an attempt to improve knowledge of cancer, cancer prevention and early detection, and, ultimately, to decrease the cancer incidence and death rate. The educational programs for cancer prevention were developed as booklet, cartoon, web frame comic strips, web flash animation and PDA animation. In addition to the existing booklets, they were also developed as web frame comic strips, web flash animation and PDA animation, using cartoons and information technology. Also the effectiveness and preference of educational media were evaluated. The educational program for cancer prevention in this paper was developed by a development team for information of medical science in the Information and Development Center for Bio-knowledge Foundation of Chungbuk National University. And this development team transformed into a team responsible for contents, development of detailed contents, production of contents and use-stage of contents. The contents of this program include 10 topics: A definition of cancer, DNA and genes, DNA and cancer, Immune function and cancer, Characteristics of cancer cell, A malignant tumor and a benign tumor, Symptoms of cancer, Stadium of cancer, Treatment of cancer and Prevention of cancer. The educational program for

cancer prevention developed in this study was educated for adults over the age of 20, and its effectiveness was evaluated. For all five groups of educational media in this study, the knowledge of cancer increased with statistical significance after education. But there was no significant difference among 5 groups of educational media. The result of this study corresponds to that of the study by Bader and Strickman-Stein (2003) where 45 lung cancer patients were made into 5 groups of 9 members, and 5 styles of information, that is, booklet, Internet information in the form of text (email), voiced information, Internet information in the form of text and voice, and cartoon were allotted respectively to each of the 5 groups. After educated through the allotted media, all the groups showed increase in their cancer knowledge [16]. It also agrees with the report of Kroeze et al (2008) that the feedback of both groups increased after having education on ingestion of fat through booklet and CD-ROM respectively [17].

This result means that education help increase the cancer knowledge of subjects regardless of the style of contents or the way to furnish information to subjects

This suggests that the educational project should be included in the health care policy for cancer prevention and early detection. This research team surveyed subjects' preference for educational media, thinking that if the media which subjects prefer is used, the effectiveness of education will be raised. As a result, it was shown that subjects liked web flash animation the most and age had little influence on the preferred media. This corresponded with the result showing that web flash animation was preferred by all ages, all venereal diseases, and all school backgrounds[7].

This study showed that age difference had little statistical significance, but older people preferred cartoons to animation. Older people have difficulties in adapting their eyes to light change due to the hardened sphincter muscle of the pupil by aging, need much time in adapting their eyes to the strength of light with the threshold to perception of light increase, and suffer pains from eye dazzling [16]. That is why they prefer cartoons to animation which has fast change of images of vivid color and light.

Therefore, when education is carried out in a local community, subjects' preference for media should be considered for the educatee’s convenience.

To increase the effectiveness of educational program, various kinds of contents should be developed on the basis of subjects' general features, school backgrounds and tastes, and to help subjects access to the contents easily, Internet, cell phones and PDA should be offered. With the recent explosive use of Internet and smart-phones, various programs using a smart-phone are being developed and used. When information systems for health and medical treatment are built up, those educational programs reflecting the changes of the times and developed for Internet or Smart-phone users will help people acquire proper medical information easily and change their attitudes to health care, ultimately leading to cancer prevention and early detection.

6. CONCLUSION

This paper is aimed at developing an educational program for cancer prevention, using various kinds of educational media, and, through this program, trying to examine the effectiveness of the education for cancer prevention and the preference for educational media. The educational program for cancer prevention was developed by the Information and Development Center for Bio-knowledge Foundation of Chungbuk National University, and the effectiveness of the program was evaluated by the knowledge of cancer and the preference of educational media. The period for program development was from April, 2005 to March, 2006, and the period for its evaluation was from April to May, 2006. The plan of this study was an experimental one for the nonequivalent control group design. The subjects of study were 125 adults over the age of 20 living in C city and E county of Chungbuk province. The educational programs for cancer prevention were developed as booklet, cartoon, web frame comic strips, web flash animation and PDA animation, and the effectiveness of the educational program was evaluated by a questionnaire developed based on the program contents. The knowledge of cancer increased more in all 5 groups of media after the education for cancer prevention before the education, but there was little difference among the educational media groups. As for a result of the preference survey for educational media after education, web flash animation was preferred the highest, followed by cartoon, web frame comic strips, PDA animation and lastly booklet. But there was no difference among ages.

This study confirmed that the educational program for cancer prevention was effective in improving the knowledge of cancer. If the education for cancer prevention is conducted based on the findings to local residents, their activities for cancer prevention and cancer screening will be increased and eventually the cancer incidence and death rate will be decreased. If programs using a variety of educational media and reflecting residents' preference of those media are developed, interests in the education and its effectiveness will increase.

On the basis of the above-mentioned result, We make the following suggestions:

・This study estimated the effectiveness of the education for cancer prevention only by the knowledge of cancer, but in the long run the effectiveness should be estimated by cancer prevention practices, cancer screening rates, and cancer death rates.

・ Considering the residents' preference of educational media, researches are required to estimate the effectiveness of the education for cancer prevention by using educational media both more preferred and less preferred.

・Further researches are required to develop educational contents for cancer prevention using the broadcasting media, main source for local residents' acquisition of health information, and to evaluate their effectiveness.

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