

## Stages of Change in Reducing Fast Food Consumption, Health Behaviors, Psychosocial Factors and Nutrient Intakes of University Students in Daejeon\*

Kyungwon Kim,<sup>†</sup> Yun Ahn, Eun Hye Moon, Eun Mi Shin

Department of Food and Nutrition, College of Natural Sciences, Seoul Women's University, Seoul, Korea

### ABSTRACT

The study purpose was to examine which factors including health perceptions & behaviors, psychosocial factors, dietary intakes were different by stages of change to reduce fast food consumption among university students. Survey data(n = 341) were analyzed using  $\chi^2$  test or analysis of variance. With respect to stages of change, 17% were in the precontemplation ; 21.4% for contemplation, 19.7% for preparation, 11.7% for action, and 30.2% for the maintenance stage. Frequency of fast food consumption(p < 0.001), health status, interest toward health, and exercising behavior(p < 0.05) differed significantly by stages of change. Demographics and nutrient intakes, however, had no association with stages of change. Those in precontemplation through preparation stages felt more strongly on the advantages such as taste, satiety, cleanness of restaurants(p < 0.001), and diverse menus(p < 0.05). Compared to maintainers or actors, precontemplators agreed less to the disadvantages of eating fast foods, including sanitary problems(p < 0.001), overeating, indigestion, decreased vegetable intakes(p < 0.01) and loss of freshness(p < 0.05). Influence of significant others(e.g., friends, siblings, parents) significantly differed by stages of change. Compared with maintainers, those in preaction stages felt less control over facilitators or situations for fast food consumption. These included 'others like fast foods', 'providing standard meals', 'when I don't have foods for meals'(p < 0.001), availability, advertisement, 'socially popular', 'when I feel hungry'(p < 0.01), and 'when I don't like to prepare meals'(p < 0.05). These results suggested that nutrition education be planned considering one's stages of change for fast food consumption. For those in preaction stages, it is desirable to use motivational strategies to increase benefits and remove barriers of change, and help to develop skills to deal with situations or factors for fast food consumption. The support from friends or families is also needed to move to further stages. (*J Community Nutrition* 7(1) : 8~20, 2005)

**KEY WORDS :** fast food · stages of change · psychosocial factors · nutrient intake · university students.

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### Introduction

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With economic growth and lifestyle changes, dining-out and consumption of fast foods are increasing. Fast foods were commonly consumed by adolescents or young adults (Park et al. 1999). In a survey with university students in Seoul, Han(1992) reported that fast food users were 63%, and that 70% of students preferred to eat high-caloric foods(e.g., ham-

burgers, fried chicken). A recent survey in the Pusan area found that 83.2% of university students were fast food users, and that females or younger students used fast foods more frequently than the counterparts (Shin, Roh 2000).

Frequent consumption of fast foods raised the nutritional concern ; it leads to excessive intakes of energy, fats, sodium as well as decreased intakes of fiber and some vitamins (Kim et al. 1990 ; Paeratakul et al. 2003). In addition, frequent use of fast foods was related to eating habits preferring western style foods, salty foods and eating-out (Kim 2003 ; Lim 1997 ; Sim, Kim 1993). Recently, there was an effort to develop nutrition policy on fast food and soft drink use by suggesting mandatory nutrition labeling, nutrition education at schools or through websites (Chung et al. 2004).

To understand the nutrition behavior and make a desirable

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<sup>†</sup>Corresponding author : Kyungwon Kim, Food & Nutrition, College of Natural Sciences, Seoul Women's University, 126 Kognung 2-dong, Nowon-gu, Seoul 139-774, Korea

Tel : (02) 970-5647, Fax : (02) 976-4049

E-mail : kwkim@swu.ac.kr

change in nutrition behavior, it is necessary to identify factors that influence nutrition behaviors. The theory-based research has advantages for explaining and predicting behaviors (Ryn, Heaney 1992). In health or nutrition research, theories or models such as social cognitive theory, theory of planned behavior, health belief model, and the stages of change model has been applied (Bandura 1986 ; Ajzen 1991 ; Glanz et al. 1997 ; Sigman-Grant 1996) Recently, the stages of change model received attention in nutrition research, in that it attempts to examine and explain the behavior or behavioral change as stages moving from precontemplation to maintenance stages (McDonell et al. 1998 ; Feldman et al. 2000 ; Jantz et al. 2002).

According to the recent model of stage of change on nutrition behavior changes, people are in any stages from precontemplation, contemplation, preparation, action, and maintenance depending on their readiness to adopt a behavior and moves to further stages in the process of behavioral change. Precontemplation is defined as the stage when one is not interested in behavior change (e.g., reducing fat intake, increasing vegetable intake) and has no intention to change. Contemplation is the stage at which one is thinking about behavior change but has not made any changes. Preparation refers to the stage at which one commits to take action in the near future. Action is the stage to make efforts to adopt or change the behavior. Maintenance is the stage when one continues and maintains the behavioral change (Greene et al. 1994 ; Sigman-Grant 1996). The stages of change model is useful for understanding how and when to apply concepts or psychosocial factors from other theories, to successfully change the behavior.

The stages of change have been applied to explain nutrition behaviors such as reducing fat intake (Chung 2004 ; Greene et al. 1994 ; Kwon, Oh 2003 ; McDonell et al. 1998 ; Oh et al. 2000), increasing fruits and vegetable intake (Campbell et al. 1999 ; Van Duyn et al. 1998), and nutrition interventions to promote dietary change (Feldman et al. 2000 ; Verheijden et al. 2004).

One of the psychosocial theories, the theory of planned behavior, is also useful in identifying factors related to nutrition behavior (Ajzen 1991 ; Godin, Kok 1996). The theory of planned behavior includes three constructs to explain the intention to perform the behavior (Ajzen 1991). These are attitudes toward the behavior, subjective norms (social influence), and perceived behavioral control, which are determined

by conceptually distinct beliefs. The theory of planned behavior has been used to understand smoking and exercise as well as nutrition behaviors (Backman et al. 2002 ; Godin, Kok 1996 ; Kim, Park 2001 ; Kim, Shin 2003).

Applying the stages of change and the theory of planned behavior, this study was designed to examine the stages of change to reduce fast food consumption of university students, and to investigate which factors including health perceptions and behaviors, psychosocial factors, dietary intakes were different by these stages of change. The results of this study will provide baseline information for targeting and developing nutrition education programs and messages for university students according to stages of change.

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## Subjects and Methods

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### 1. Subjects

This study employed a cross-sectional survey design. Subjects for this study were 371 students recruited from four universities in the Daejeon area. The survey was conducted at classes for the liberal arts, and food and nutrition during 2003 and 2004. The data of 341 students was analyzed excluding the data of incomplete responses to the questionnaire.

### 2. Survey instrument

The survey questionnaire included scales to measure general characteristics, health related behaviors, stages of change in fast food consumption, fast food consumption status, and psychosocial factors related to fast food consumption and nutrient intakes. The details of developing a survey questionnaire are described in the previous study (Kim et al. 2004).

Items for general characteristics included age, sex, major, height, weight, living status and so on. Health related variables were assessed by asking perceived health status, interest toward health, smoking, drinking status and regular exercise.

Stages of change to reduce fast food consumption were assessed by the item based on previous studies (McDonell et al. 1998 ; Sigman-Grant 1996 ; Van Duyn et al. 1998). Subjects were categorized into 5 stages of change by responses to the items as follows :

- Precontemplation : Those who eat fast foods frequently (at least 3 – 4 times a month), and those who do not intend to reduce in the next 6 months.
- Contemplation : Those who eat fast foods frequently, but those who intend to reduce in the next 6 months.

- Preparation : Those who eat fast foods frequently, but those who intend to reduce in the next month.
- Action : Those who have not eaten fast foods frequently for less than the past 6 months.
- Maintenance : Those who have not eaten fast foods frequently for more than the past 6 months, and those who will not do it.

Variables for measuring fast food consumption were based on pilot study, and adapted or modified through a literature review (Han 1992 ; Lim 1997 ; Park et al. 1999 ; Park, Jun 2001). The items included if he/she uses fast food, the types and frequency of fast food consumption.

Psychosocial factors related to fast food consumption were constructed based on a pilot study with 26 students. Behavioral beliefs were measured using 18 items, and Cronbach's alpha was 0.71. These included advantages of eating fast foods (e.g., convenience, taste, diverse menus, making me feel full, and cost) and disadvantages of eating fast foods (e.g., eating salty foods more, drinking more soda, eating less vegetables, high in fat). These items were measured on a 5-point scale from 'very unlikely' (-2) to 'very likely' (+2) to indicate the strength of these beliefs. Attitudes toward fast food consumption were assessed as summated score of behavioral beliefs.

Pilot study (n = 26) indicated that there were seven types of people or influences related to fast food consumption of university students. These included parents, brothers/sisters, relatives, friends, boy/girl friend, TV/radio, newspapers/magazines/internet. Items for normative beliefs were measured on a 5-point scale from 'very unlikely' (-2) to 'very likely' (+2). The corresponding motivation to comply with each significant influence was measured on a 5-point scale from 'not at all' (0) to 'very much' (4). The subjective normative items were defined as the product of each normative belief and motivation to comply (Cronbach'  $\alpha = 0.75$ ).

Items to assess control beliefs were developed from responses (n = 26) regarding factors or situations that made it difficult to eat fast foods. Nineteen items in this scale included perceived facilitating factors or barriers (e.g., availability, for gatherings, events/sales, advertising, dieting), and confidence in controlling fast food consumption in several situations (e.g., hungry, time, meal preparation issues). These items were rated on 5-point scales from 'very unlikely' (-2) to 'very likely' (+2). The Cronbach's alpha of this scale was 0.73, and overall perceived control was defined as a summated

score of these 19 items.

Nutrient intake was assessed using 24-hour recall method. The investigator explained how to keep food record for 24-hour recall and showed the portion sizes of food, in order to collect information more accurately. Nutrient intakes were analyzed by Computer Aided Nutritional Analysis Program for Professionals 2.0 (Korean Nutrition Society 2002).

### 3. Statistical analysis

Statistical Analysis System (SAS) PC Package 8.2 was used to analyze the data. Descriptive statistics were used to examine the distribution of study variables. To investigate if study variables were different by stages of change in fast food consumption, analysis of variance (ANOVA) or  $\chi^2$ -test was used. Duncan's multiple range test was used in ANOVA to examine which groups according to stages of change were significantly different in study variables examined. Statistical significance were examined at  $\alpha = 0.05$ .

## Results

### 1. General characteristics of subjects

The distribution of subjects by stages of change showed that the precontemplation stage comprised 17.0%, the contemplation stage was 21.4%, and the preparation stage was 19.7% (Fig. 1). Action stage was only 11.7%, while the maintenance stage was the largest group (30.2%).

General characteristics of subjects are shown in Table 1 and 2. The mean age of subjects was 21.7 years (Table 1). Subjects were mostly women (62.2%), freshmen or sophomore (78.3%), and majored in other than food & nutrition (61.5%), and lived with family members (48.1%) or self-

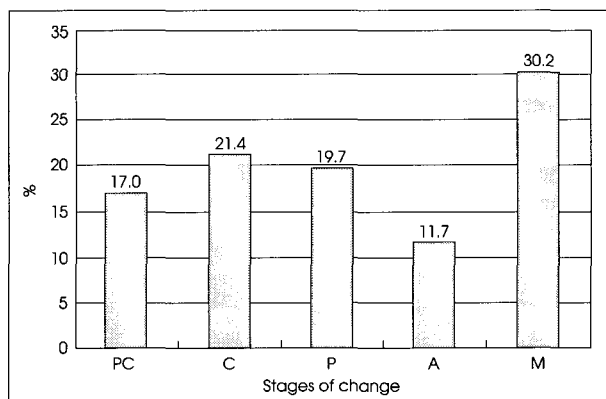


Fig. 1. Distribution of subjects by stages of change to reduce fast food consumption. PC : Precontemplation, C : Contemplation, P : Preparation, A : Action, M : Maintenance stage.

**Table 1.** Mean age, body size and fast food consumption of subjects by stages of change to reduce fast food consumption

Variables	Total (n = 341)	Stages of change					F
		Precontemplation (n = 58)	Contemplation (n = 73)	Preparation (n = 67)	Action (n = 40)	Maintenance (n = 103)	
Age (years)	21.7 ± 0.2 <sup>b</sup>	21.1 ± 0.5	21.0 ± 0.5	21.6 ± 0.5	22.5 ± 0.6	22.4 ± 0.4	2.2
Height (cm)							
Male	174.2 ± 0.6	174.0 ± 1.3	172.8 ± 1.4	175.0 ± 1.4	174.9 ± 1.8	174.3 ± 1.0	0.4
Female	161.4 ± 0.6	160.9 ± 1.5	162.3 ± 1.2	158.7 ± 1.3	162.8 ± 1.6	162.1 ± 1.1	1.6
Weight (kg)							
Male	67.3 ± 1.0	66.3 ± 2.2	67.9 ± 2.3	68.7 ± 2.3	66.6 ± 3.1	67.1 ± 1.7	0.2
Female	53.6 ± 0.7	50.1 ± 1.8	53.2 ± 1.5	56.2 ± 1.6	55.2 ± 2.0	53.2 ± 1.3	1.8
Pocket money (10,000 won/month)	25.4 ± 0.8	28.7 ± 1.8	24.8 ± 1.6	22.8 ± 1.7	25.0 ± 2.2	25.9 ± 1.4	1.5
Frequency of eating fast foods per month	6.7 ± 0.3	7.2 ± 0.6 <sup>ab</sup>	7.5 ± 0.5 <sup>a</sup>	8.0 ± 0.6 <sup>a</sup>	5.4 ± 0.9 <sup>b</sup>	2.9 ± 0.8 <sup>c</sup>	8.5 <sup>***</sup>

1) Mean ± SE, by ANOVA, \*\*\* : p < 0.001, Alphabets with different superscripts show the differences among the groups

**Table 2.** General characteristics of subjects by stages of change to reduce fast food consumption

Variables	Total (n = 341)	Stages of change					$\chi^2$
		Precontemplation (n = 58)	Contemplation (n = 73)	Preparation (n = 67)	Action (n = 40)	Maintenance (n = 103)	
Sex							
Male	129(37.8) <sup>1)</sup>	26(44.8)	23(31.5)	24(35.8)	13(32.5)	43(41.7)	3.7
Female	212(62.2)	32(55.2)	50(68.5)	43(64.2)	27(67.5)	60(58.3)	
Major <sup>2)</sup>							
Food & nutrition	130(38.5)	21(36.8)	24(33.3)	28(41.8)	18(45.0)	39(38.2)	1.9
Others	208(61.5)	36(63.2)	48(66.7)	39(58.2)	22(55.0)	63(61.8)	
Grade							
Freshmen	75(22.0)	16(27.6)	16(21.9)	11(16.4)	12(30.0)	20(19.4)	7.9
Sophomore	192(56.3)	29(50.0)	40(54.8)	44(65.7)	22(55.0)	57(55.3)	
Junior	33( 9.7)	5( 8.6)	7( 9.6)	7(10.4)	3( 7.5)	11(10.7)	
Senior	41(12.0)	8(13.8)	10(13.7)	5( 7.5)	3( 7.5)	15(14.6)	
Living status							
W/family	164(48.1)	24(41.4)	41(56.2)	36(53.7)	20(50.0)	43(41.7)	13.3
Dormitory	45(13.2)	7(12.1)	10(13.7)	11(16.4)	5(12.5)	12(11.7)	
Self-boarding	97(28.4)	23(39.6)	13(17.8)	14(20.9)	11(27.5)	36(34.9)	
Others	35(10.3)	4( 6.9)	9(12.3)	6( 9.0)	4(10.0)	12(11.7)	

1) n(%). None of the variables were statistically significant by  $\chi^2$ -test. 2) missing number : 3

boarding (28.4%) (Table 2). Mean height and weight were 174.2cm, 67.3kg for male students, and 161.4cm, 53.6kg for female students (Table 1).

The general characteristics, such as age, sex, major, living status, height, weight, and pocket money spent per month were not significantly different across the stages of change (Tables 1, 2). We noticed, however, slight differences in general characteristics by stages of change, although there was no statistical significance. For example, subjects in the action or maintenance stages were slightly older than the other stages. Those in the preparation stage weighted more than the other four stages both in men and in women, and those in the precontemplation stage spent more pocket money than the

other stages.

## 2. Fast food consumption by stages of change

Subjects consumed fast foods 6.7 times a month on the average (Table 1). Subjects in the action stage (5.4 times a month) and the maintenance stage (2.9 times a month) consumed fast foods less frequently compared to those in the rest stages (7.2 times in precontemplation stage, 8.0 times a month in preparation stage) (p < 0.001). These data suggest that grouping by stages of change is quite valid in predicting the behavior of concern (e.g., fast food consumption).

## 3. Health related variables by stages of change

Health related variables, such as perceived health status (p

< 0.05), interest toward health ( $p < 0.05$ ), and exercising behavior ( $p < 0.05$ ), was significantly different by stages of change (Table 3). Most subjects rated their perceived health status as 'very good/good' (39.9%) or 'fair' (39.6%). Those who perceived their health as 'very good/good' were only 29.3% in the precontemplation stage, while this percentage was high in the action (47.5%) or maintenance stage (37.9%) ( $p < 0.05$ ). Similarly, except those in the precontemplation stage (34.5%), about half of subjects in contemplation through maintenance stages expressed their interest to health matters as high ( $p < 0.05$ ) (Table 3).

Twenty-four percent of subjects responded that they exercised regularly (Table 3). When examined exercise behavior by stages of change, 37.5% of those in the action stage was exercising regularly, while the regular exerciser was low in the precontemplation (12.1%) or contemplation stage (19.2%) ( $p < 0.05$ ). Seventy-four percent of subjects responded that they drink alcoholic beverages and 18.8% smoke. Drinking or smoking behavior was not significantly different by stages of change, although the percentage of drinking or smoking was higher in the precontemplation stage and lower in the action stage.

#### 4. Beliefs by stages of change

##### 1) Behavioral beliefs by stages of change

Among 18 behavioral beliefs, 9 items were significantly

different by stages of change (Table 4). The advantages of eating fast foods, identified as significant by stages of change, included 'tasting good' ( $p < 0.001$ ), 'making me feel full' ( $p < 0.001$ ), 'good because fast food restaurants are clean' ( $p < 0.01$ ), and 'diverse menus' ( $p < 0.05$ ). Subjects in the precontemplation or preparation stage felt more strongly that fast foods taste good than those in the action or maintenance stage ( $p < 0.001$ ). Subjects in the action or maintenance stage rated negatively on 'diverse menus in fast food restaurants' ( $p < 0.05$ ). Those in the maintenance group also felt less strongly that 'eating fast foods makes me feel full' ( $p < 0.001$ ), and 'eating fast foods would be good because fast food restaurants are clean' ( $p < 0.01$ ). On the other hand, those classified as precontemplation through preparation stage felt more strongly about the advantages of eating fast foods.

With respect to disadvantages of eating fast foods, items of 'fast foods are not sanitary' ( $p < 0.001$ ), 'making me overeat' ( $p < 0.01$ ), 'causing me to have indigestion' ( $p < 0.01$ ), 'making me eat vegetable less' ( $p < 0.01$ ), 'fast foods are not fresh' ( $p < 0.01$ ) were significantly different by stages of change. These differences were more clearly found between precontemplation group and maintenance group (Table 4). Compared to maintenance stage or other stages, those in the precontemplation stage were less agreed to 'fast foods are not sanitary' ( $p < 0.001$ ), 'causing me to have indigestion' ( $p < 0.01$ ), and 'fast foods are not fresh' ( $p < 0.01$ ). Those in the

**Table 3.** Health perceptions and behaviors by stages of change to reduce fast food consumption

Variables	Total (n = 341)	Stages of change					$\chi^2$
		Precontemplation (n = 58)	Contemplation (n = 73)	Preparation (n = 67)	Action (n = 40)	Maintenance (n = 103)	
Perceived health status							
Very good/good	136(39.9) <sup>1)</sup>	17(29.3)	24(32.9)	37(55.2)	19(47.5)	39(37.9)	19.8*
Fair	135(39.6)	30(51.7)	34(46.6)	21(31.4)	8(20.0)	42(40.7)	
Bad/very bad	70(20.5)	11(19.0)	15(20.5)	9(13.4)	13(32.5)	22(21.4)	
Interest toward health							
Very much/much	176(51.6)	20(34.5)	39(53.4)	38(56.7)	21(52.5)	58(56.3)	17.0*
Average	139(40.8)	33(56.9)	24(32.9)	25(37.3)	19(47.5)	38(36.9)	
Little/very little	26( 7.6)	5( 8.6)	10(13.7)	4( 6.0)	0( 0.0)	7( 6.8)	
Exercising regularly <sup>2)</sup>							
Yes	82(24.1)	7(12.1)	14(19.2)	20(30.3)	15(37.5)	26(25.2)	10.9*
No	258(75.9)	51(87.9)	59(80.8)	46(69.7)	25(62.5)	77(74.8)	
Drinking <sup>2)</sup>							
Yes	252(74.1)	48(82.8)	58(79.4)	46(68.7)	25(62.5)	75(73.5)	7.2
No	88(25.9)	10(17.2)	15(20.6)	21(31.3)	15(37.5)	27(26.5)	
Smoking <sup>2)</sup>							
Yes	64(18.8)	18(31.0)	10(13.7)	12(17.9)	5(12.5)	19(18.6)	8.0
No	276(81.2)	40(69.0)	63(86.3)	55(82.1)	35(87.5)	83(81.4)	

1) n(%), by  $\chi^2$ -test, \* :  $p < 0.05$ , 2) missing number : 1

**Table 4.** Perceived advantages and disadvantages of eating fast foods by stages of change

Variables	Stages of change					F
	Precontemplation (n = 58)	Contemplation (n = 73)	Preparation (n = 67)	Action (n = 40)	Maintenance (n = 103)	
Eating fast foods regularly would... <sup>1)</sup>						
<u>Advantages</u>						
Taste good	0.8 ± 0.1 <sup>oz)</sup>	0.5 ± 0.1 <sup>ob</sup>	0.7 ± 0.1 <sup>a</sup>	0.4 ± 0.1 <sup>bc</sup>	0.2 ± 0.1 <sup>c</sup>	7.3 <sup>***</sup>
Make me feel full	0.4 ± 0.1 <sup>bc</sup>	0.5 ± 0.1 <sup>ob</sup>	0.8 ± 0.1 <sup>a</sup>	0.7 ± 0.2 <sup>ob</sup>	0.2 ± 0.1 <sup>c</sup>	5.0 <sup>***</sup>
Good because fast food restaurants are clean	0.6 ± 0.1 <sup>ob</sup>	0.4 ± 0.1 <sup>bc</sup>	0.7 ± 0.1 <sup>a</sup>	0.5 ± 0.1 <sup>abc</sup>	0.3 ± 0.1 <sup>c</sup>	3.7 <sup>**</sup>
Good because there are many menus	0.1 ± 0.1 <sup>a</sup>	0.0 ± 0.1 <sup>a</sup>	0.1 ± 0.1 <sup>a</sup>	-0.2 ± 0.1 <sup>b</sup>	-0.3 ± 0.1 <sup>b</sup>	2.7 <sup>*</sup>
Convenient (easy to buy)	1.0 ± 0.1	1.0 ± 0.1	0.8 ± 0.1	0.8 ± 0.1	0.8 ± 0.1	2.2
Makes me spend less money	-0.4 ± 0.1	-0.1 ± 0.1	-0.4 ± 0.1	-0.3 ± 0.1	-0.5 ± 0.1	1.5
Good because foods are serviced in a short time	0.9 ± 0.1	0.9 ± 0.1	0.9 ± 0.1	1.0 ± 0.1	0.8 ± 0.1	0.6
Good because taking-out is possible	0.8 ± 0.1	1.0 ± 0.1	0.9 ± 0.1	0.9 ± 0.1	0.9 ± 0.1	0.4
Convenient (no need to prepare foods)	1.2 ± 0.1	1.1 ± 0.1	1.1 ± 0.1	1.2 ± 0.1	1.1 ± 0.1	0.3
<u>Disadvantages</u>						
Not sanitary	-0.3 ± 0.1 <sup>a</sup>	0.1 ± 0.1 <sup>bc</sup>	0.0 ± 0.1 <sup>abc</sup>	-0.1 ± 0.1 <sup>ob</sup>	0.2 ± 0.1 <sup>c</sup>	4.7 <sup>***</sup>
Makes me overeat	0.1 ± 0.1 <sup>a</sup>	0.2 ± 0.1 <sup>ob</sup>	0.5 ± 0.1 <sup>b</sup>	0.1 ± 0.1 <sup>a</sup>	-0.1 ± 0.1 <sup>a</sup>	4.4 <sup>**</sup>
Causes me to have indigestion	-0.4 ± 0.1 <sup>a</sup>	0.1 ± 0.1 <sup>b</sup>	0.1 ± 0.1 <sup>b</sup>	0.1 ± 0.1 <sup>b</sup>	0.2 ± 0.1 <sup>b</sup>	3.8 <sup>**</sup>
Makes me eat vegetables less	-0.1 ± 0.1 <sup>a</sup>	0.1 ± 0.1 <sup>ob</sup>	0.4 ± 0.1 <sup>b</sup>	0.3 ± 0.2 <sup>b</sup>	0.4 ± 0.1 <sup>b</sup>	3.6 <sup>**</sup>
Bad because foods are not fresh	-0.3 ± 0.1 <sup>a</sup>	0.0 ± 0.1 <sup>ob</sup>	0.0 ± 0.1 <sup>ob</sup>	0.0 ± 0.1 <sup>ob</sup>	0.2 ± 0.1 <sup>b</sup>	3.4 <sup>**</sup>
Makes me fat	0.4 ± 0.1	0.8 ± 0.1	0.9 ± 0.1	0.9 ± 0.2	0.7 ± 0.1	2.3
Makes me drink more soda	1.1 ± 0.1	0.9 ± 0.1	0.9 ± 0.1	1.1 ± 0.2	0.7 ± 0.1	1.7
Makes me eat fatty foods	0.9 ± 0.1	1.0 ± 0.1	1.1 ± 0.1	1.3 ± 0.1	1.1 ± 0.1	1.5
Makes me eat salty foods more	0.3 ± 0.1	0.2 ± 0.1	0.4 ± 0.1	0.2 ± 0.2	0.2 ± 0.1	0.8
Total attitude score	3.7 ± 0.7 <sup>a</sup>	2.0 ± 0.6 <sup>ob</sup>	1.4 ± 0.6 <sup>bc</sup>	1.1 ± 0.8 <sup>bc</sup>	-0.3 ± 0.5 <sup>c</sup>	6.0 <sup>***</sup>

1) Each item was measured from -2 (very unlikely) to +2 (very likely). The higher score indicates that subject agree to each item more strongly.

2) Mean ± SE, by ANOVA, \* : p < 0.05, \*\* : p < 0.01, \*\*\* : p < 0.001. Alphabets with different superscripts show the differences among the groups.

preparation through maintenance stage felt more strongly that 'fast foods make me eat vegetables less' than those in the contemplation or contemplation stage (p < 0.01). Preparation group felt more strongly that 'eating fast foods make me overeat' than other groups (p < 0.01). From these results, it seemed that those in the precontemplation stage did not feel seriously the disadvantages of eating fast foods and do not attempt to reduce eating fast foods. On the other hand, maintenance group realized the bad aspects of fast foods in terms of nutrition or sanitation more clearly and took action to reduce fast food consumption.

The attitude toward fast food consumption was significantly different across the stages of change (p < 0.001) (Table 4). The attitude score was the highest in the precontemplation group, meaning that they held more positive attitudes toward eating fast foods than any other groups and the lowest in the

maintenance group.

## 2) Normative beliefs by stages of change

Results regarding social influences showed that the perceived influence of significant others were significantly different by stages of change (Table 5). Regardless of the stages of change, parents and relatives (e.g., grandparents) were the groups that oppose subject's eating of fast foods. The score of 'parents' or 'relatives' was most negative in the maintenance stage, meaning that subjects in this group received more pressure not to eat fast foods from parents or relatives than the other groups, while the score of these items was more positive in the precontemplation stage (p < 0.001). Subjects except in the precontemplation stage, also rated that siblings opposed subject's eating of fast foods (p < 0.001), although the degree was less severe than parents or relatives.

**Table 5.** Subjective normative items by stages of change

Variables	Stages of change					F
	Precontemplation (n = 58)	Contemplation (n = 73)	Preparation (n = 67)	Action (n = 40)	Maintenance (n = 103)	
Normative beliefs × motivation to comply <sup>1)</sup>						
Boy/girl friend	0.8 ± 0.3 <sup>a2)</sup>	0.6 ± 0.2 <sup>a</sup>	-0.2 ± 0.3 <sup>b</sup>	0.1 ± 0.3 <sup>ab</sup>	-1.0 ± 0.2 <sup>c</sup>	9.2 <sup>***</sup>
Brothers/sisters	0.6 ± 0.2 <sup>a</sup>	-0.3 ± 0.2 <sup>b</sup>	-0.1 ± 0.2 <sup>ab</sup>	-0.2 ± 0.3 <sup>b</sup>	-1.0 ± 0.2 <sup>c</sup>	8.0 <sup>***</sup>
Parents	-0.4 ± 0.3 <sup>a</sup>	-1.5 ± 0.2 <sup>bc</sup>	-0.8 ± 0.3 <sup>ab</sup>	-1.0 ± 0.3 <sup>ab</sup>	-2.0 ± 0.2 <sup>c</sup>	7.8 <sup>***</sup>
Relatives (e.g. grandparents)	-0.4 ± 0.2 <sup>a</sup>	-1.0 ± 0.2 <sup>a</sup>	-0.9 ± 0.2 <sup>a</sup>	-0.9 ± 0.3 <sup>a</sup>	-1.9 ± 0.2 <sup>b</sup>	7.3 <sup>***</sup>
Friends	1.1 ± 0.2 <sup>a</sup>	0.7 ± 0.2 <sup>ab</sup>	0.2 ± 0.2 <sup>bc</sup>	0.2 ± 0.3 <sup>bc</sup>	-0.3 ± 0.2 <sup>c</sup>	6.1 <sup>***</sup>
Newspaper, magazines, internet	0.6 ± 0.3 <sup>ab</sup>	1.1 ± 0.2 <sup>ab</sup>	1.2 ± 0.2 <sup>a</sup>	0.6 ± 0.3 <sup>ab</sup>	0.3 ± 0.2 <sup>b</sup>	2.6 <sup>*</sup>
TV, radio	0.9 ± 0.3	1.2 ± 0.2	0.9 ± 0.3	0.7 ± 0.3	0.6 ± 0.2	1.0
Total score of subjective norms	3.3 ± 1.1 <sup>a</sup>	0.7 ± 1.0 <sup>ab</sup>	0.2 ± 1.0 <sup>ab</sup>	-0.4 ± 1.3 <sup>b</sup>	-5.3 ± 0.8 <sup>c</sup>	11.7 <sup>***</sup>

1) Each normative belief was measured from -2 (strongly disagree) to +2 (strongly agree). Each item indicates how strongly significant other supports eating of fast foods of subjects. The corresponding motivation to comply was measured from 0 (not at all) to +4 (very much). Possible score for each item was from -8 to +8.

2) Mean ± SE, by ANOVA. \* : p < 0.05, \*\*\* : p < 0.001. Alphabets with different superscripts show the differences among the groups.

Friends or boy/girl friends approved the subject's eating of fast foods to a certain extent. 'Boy/girl friend' (p < 0.001) or 'friends' (p < 0.001) in the precontemplation stage were more likely to approve subject's eating of fast foods, while the responses of these social groups were most negative in the maintenance stage (p < 0.001) (Table 5). Friends or boy/girl friend are the social groups that shares thoughts and ideas with subjects, and they showed more approval than family members regarding subject's fast food consumption. With respect to mass communications, written materials such as newspapers and magazines had a positive influence on subject's fast food consumption, with contemplation or preparation group receiving most influence and the maintenance group receiving less influence (p < 0.05). The score of broadcasting, such as TV and radio, was positive in all groups and there was no statistical significance across the stages of change.

The overall social influence was significantly different by stages of change (p < 0.001) (Table 5). These results suggested that significant others or influences have an impact on stages of change in reducing fast food consumption.

### 3) Control beliefs by stages of change

The results regarding control beliefs showed that twelve beliefs out of nineteen items were significantly different by stages of change (Table 6). Most of the groups, especially the precontemplators, disagreed on the belief that it is difficult to eat fast foods because of dieting (p < 0.001). Subjects might realize that consumption of fast foods increase fat intake or weight gain, but this perception might not be related to the behavior of reducing fast food consumption for dieting.

The facilitators of fast food consumption, 'because others (e.g., friends) like fast foods' (p < 0.001), 'when others want to eat fast foods' (p < 0.05) were also different by stages of change, with maintenance group showing least agreement with these statements. Compared to those in the precontemplation or preparation stage, those in the maintenance or action stage disagreed on the item, 'easy to eat fast foods because fast food restaurants provide standard meals' (e.g., taste) (p < 0.001). On the other hand, maintenance group compared with contemplation group, agreed more to 'not eating fast foods because of food quality' (p < 0.001).

Subjects in the maintenance stage also felt more control over eating fast foods than those in the other stages in situations such as 'when I do not have foods for meals' (p < 0.001), 'when I feel hungry' (p < 0.01), and 'when I do not like to cook/prepare meals' (maintenance vs. precontemplation through preparation stage (p < 0.05) (Table 6). These results supported that convenience and quickness in service are the major considerations in fast food consumption.

Availability issues (e.g., easy to use fast foods because there are many fast food restaurants) were found to be differentiating maintainers with other groups. More specifically, precontemplation through preparation group agreed more to availability issues than maintenance group did. However, subjects did not agree to the item, 'fast foods are popular socially', especially in the maintenance group (p < 0.01). The belief, 'advertisement as a facilitator of fast food consumption', was different between preaction stages and action/maintenance stages (p < 0.01). These suggest that perceived control over environmental influences is also important in

**Table 6.** Perceived control items by stages of change

Variables	Stages of change					F
	Precontemplation (n = 58)	Contemplation (n = 73)	Preparation (n = 67)	Action (n = 40)	Maintenance (n = 103)	
It's easy to eat fast foods ... <sup>1)</sup>						
Difficult to use/eat fast foods because of dieting	-1.0 ± 0.1 <sup>02)</sup>	-0.6 ± 0.1 <sup>b</sup>	-0.3 ± 0.1 <sup>bc</sup>	0.0 ± 0.2 <sup>c</sup>	-0.3 ± 0.1 <sup>bc</sup>	7.2 <sup>***</sup>
Because others like it (e.g., friends)	0.5 ± 0.1 <sup>a</sup>	0.4 ± 0.1 <sup>a</sup>	0.5 ± 0.1 <sup>a</sup>	0.4 ± 0.1 <sup>a</sup>	0.0 ± 0.1 <sup>b</sup>	6.3 <sup>***</sup>
Because fast food chains provide standard meals (e.g., taste)	-0.1 ± 0.1 <sup>a</sup>	-0.2 ± 0.1 <sup>ab</sup>	0.0 ± 0.1 <sup>a</sup>	-0.5 ± 0.2 <sup>bc</sup>	-0.6 ± 0.1 <sup>c</sup>	5.3 <sup>***</sup>
When I do not have food for meals	0.6 ± 0.1 <sup>a</sup>	0.7 ± 0.1 <sup>a</sup>	0.5 ± 0.1 <sup>a</sup>	0.6 ± 0.1 <sup>a</sup>	0.1 ± 0.1 <sup>b</sup>	5.2 <sup>***</sup>
Difficult to eat because of food quality	0.3 ± 0.1 <sup>a</sup>	0.4 ± 0.1 <sup>ab</sup>	0.2 ± 0.1 <sup>a</sup>	0.2 ± 0.2 <sup>a</sup>	0.7 ± 0.1 <sup>b</sup>	4.9 <sup>***</sup>
Because there are many fast food restaurants (availability)	0.6 ± 0.1 <sup>a</sup>	0.5 ± 0.1 <sup>a</sup>	0.6 ± 0.1 <sup>a</sup>	0.4 ± 0.1 <sup>ab</sup>	0.1 ± 0.1 <sup>b</sup>	4.3 <sup>**</sup>
Because fast foods are popular socially	-0.2 ± 0.1 <sup>a</sup>	-0.3 ± 0.1 <sup>a</sup>	-0.3 ± 0.1 <sup>a</sup>	-0.4 ± 0.1 <sup>ab</sup>	-0.7 ± 0.1 <sup>b</sup>	4.3 <sup>**</sup>
When I feel hungry	0.6 ± 0.1 <sup>a</sup>	0.5 ± 0.1 <sup>a</sup>	0.5 ± 0.1 <sup>a</sup>	0.5 ± 0.1 <sup>a</sup>	0.1 ± 0.1 <sup>b</sup>	4.0 <sup>**</sup>
Because of advertisement	0.2 ± 0.1 <sup>ab</sup>	0.2 ± 0.1 <sup>ab</sup>	0.3 ± 0.1 <sup>a</sup>	-0.2 ± 0.2 <sup>c</sup>	-0.2 ± 0.1 <sup>bc</sup>	3.5 <sup>**</sup>
When I do not like to cook/prepare meals	0.7 ± 0.1 <sup>a</sup>	0.5 ± 0.1 <sup>ab</sup>	0.7 ± 0.1 <sup>a</sup>	0.5 ± 0.1 <sup>ab</sup>	0.3 ± 0.1 <sup>b</sup>	2.8 <sup>*</sup>
When others wants to eat fast foods	0.3 ± 0.1 <sup>ab</sup>	0.3 ± 0.1 <sup>ab</sup>	0.4 ± 0.1 <sup>a</sup>	0.1 ± 0.2 <sup>ab</sup>	0.0 ± 0.1 <sup>b</sup>	2.7 <sup>*</sup>
Because I can get fast foods anytime that I want	0.8 ± 0.1 <sup>ab</sup>	0.8 ± 0.1 <sup>a</sup>	0.7 ± 0.1 <sup>ab</sup>	0.9 ± 0.1 <sup>a</sup>	0.5 ± 0.1 <sup>b</sup>	2.4 <sup>*</sup>
Because of events, sales	-0.1 ± 0.1	-0.2 ± 0.1	0.1 ± 0.1	-0.2 ± 0.2	-0.4 ± 0.1	1.2
When I do not have enough money	-0.6 ± 0.1	-0.4 ± 0.1	-0.5 ± 0.1	-0.8 ± 0.1	-0.6 ± 0.1	1.0
When I do not have time	0.6 ± 0.1	0.8 ± 0.1	0.8 ± 0.1	0.5 ± 0.1	0.6 ± 0.1	0.9
Difficult to eat when I like to eat home-made foods	0.3 ± 0.1	0.6 ± 0.1	0.5 ± 0.1	0.3 ± 0.2	0.6 ± 0.1	0.8
Because fast food restaurants are good for gatherings	-0.1 ± 0.1	0.0 ± 0.1	-0.1 ± 0.1	-0.2 ± 0.2	-0.2 ± 0.1	0.6
When I need to eat quickly	1.0 ± 0.1	0.9 ± 0.1	0.9 ± 0.1	0.9 ± 0.1	0.9 ± 0.1	0.4
Difficult to eat when I am sick	0.3 ± 0.1	0.5 ± 0.1	0.4 ± 0.1	0.3 ± 0.2	0.4 ± 0.1	0.2
Overall perceived control	4.8 ± 0.8 <sup>a</sup>	3.7 ± 0.7 <sup>ab</sup>	4.2 ± 0.8 <sup>a</sup>	1.5 ± 1.0 <sup>b</sup>	-1.6 ± 0.6 <sup>c</sup>	14.7 <sup>***</sup>

1) Control beliefs were measured from -2(very unlikely) to +2(very likely). The higher score indicates that subject agree to each item more strongly.

2) Mean ± SE, ANOVA. \* : p < 0.05, \*\* : p < 0.01, \*\*\* : p < 0.001. Alphabets with different superscripts show the differences among the groups.

determining stages of change.

Although there was no significant difference by stages of change, subjects generally did not agree to 'events or sales', cost, 'fast food restaurants are good for gatherings' as facilitators of eating fast foods (Table 6). It seemed that cost of foods were not associated with food consumption of university students. As we expected, subjects in the precontemplation stage showed the lowest overall perceived control over eating fast foods, while those in action or maintenance stage had more perceived control (Table 6).

### 5. Nutrient intakes by stages of change

Data regarding nutrient intakes is presented in Table 7. On average, the energy intake was 1740.7kcal, meeting only 77.8% for Korean RDA (Korean Nutrition Society 2000).

The intakes of protein, vitamin E and vitamin B6 were sufficient, while the intakes of calcium, zinc, iron and folic acid did not reach 75% of the RDA. None of the nutrient intakes were statistically significant by stages of change (Table 7). The intakes of energy and fat were high in subjects of action stage, and low in subjects of maintenance stage. Those in the precontemplation stage consumed only 53.6% of RDA for calcium, and maintainers met 65.7% of RDA for calcium, but these were not significantly different.

## Discussion

The distribution of stages of change indicated that about 42% of subjects were already in the maintenance or action



**Table 7.** Nutrient intakes by stages of change

Variables	Total (n = 341)	Stages of change					F <sup>1)</sup>
		Precontemplation (n = 58)	Contemplation (n = 73)	Preparation (n = 67)	Action (n = 40)	Maintenance (n = 103)	
Energy (kcal)	1740.7 ± 47.2 ( 77.8) <sup>2)</sup>	1788.7 ± 114.4 (78.6)	1680.9 ± 102.0 ( 76.6)	1714.2 ± 106.5 ( 77.0)	1967.1 ± 137.8 ( 86.7)	1685.2 ± 85.9 ( 75.2)	0.9
Carbohydrate (g)	238.9 ± 4.4	241.3 ± 10.6	231.5 ± 9.5	237.1 ± 9.9	244.5 ± 12.8	241.8 ± 8.0	0.3
Fat (g)	54.9 ± 2.3	55.8 ± 5.6	53.7 ± 5.0	56.0 ± 5.2	66.4 ± 6.7	50.2 ± 4.2	1.0
Protein (g)	71.2 ± 3.5 (113.8)	81.2 ± 8.4 (124.7)	60.9 ± 7.5 ( 99.2)	79.3 ± 7.9 (130.6)	74.9 ± 10.2 ( 118.4)	66.3 ± 6.3 (105.3)	1.3
Vitamin A (µgRE)	685.3 ± 20.7 ( 97.9)	679.0 ± 50.4 ( 97.0)	659.0 ± 44.9 ( 94.1)	691.1 ± 46.9 ( 98.7)	749.8 ± 60.6 (107.1)	678.6 ± 37.8 ( 96.9)	0.4
Vitamin E (mg)	14.6 ± 1.1 (145.6)	14.6 ± 2.6 (146.0)	12.2 ± 2.3 (122.0)	15.2 ± 2.4 (152.2)	21.7 ± 3.1 (216.9)	13.0 ± 1.9 (130.1)	1.8
Vitamin C (mg)	63.4 ± 2.4 ( 90.6)	57.1 ± 5.9 ( 81.5)	59.0 ± 5.2 ( 84.2)	64.6 ± 5.5 ( 92.3)	65.5 ± 7.1 ( 93.5)	68.7 ± 4.4 ( 98.1)	0.9
Thiamin (mg)	1.1 ± 0.0 ( 98.7)	1.2 ± 0.1 (101.5)	1.1 ± 0.1 (100.9)	1.1 ± 0.1 ( 97.4)	1.3 ± 0.1 (113.3)	1.0 ± 0.1 ( 90.8)	1.2
Riboflavin (mg)	1.1 ± 0.0 ( 81.0)	1.1 ± 0.1 ( 79.9)	1.0 ± 0.1 ( 77.4)	1.2 ± 0.1 ( 87.2)	1.2 ± 0.1 ( 89.7)	1.0 ± 0.1 ( 76.8)	0.9
Niacin (mgNE)	14.9 ± 0.7 ( 99.3)	15.2 ± 1.7 (100.1)	12.9 ± 1.6 ( 88.2)	15.0 ± 1.6 (101.5)	18.0 ± 2.1 (117.8)	15.0 ± 1.3 ( 98.2)	1.0
Vitamin B <sub>6</sub> (mg)	1.7 ± 0.1 (122.8)	1.8 ± 0.1 (125.7)	1.5 ± 0.1 (109.8)	1.7 ± 0.1 (122.4)	1.9 ± 0.2 (136.3)	1.8 ± 0.1 (125.2)	1.1
Folic acid (µg)	182.5 ± 4.6 ( 73.0)	180.3 ± 11.1 ( 72.1)	169.5 ± 9.9 ( 67.8)	184.2 ± 10.3 ( 73.7)	201.2 ± 13.3 ( 80.5)	184.6 ± 8.3 ( 73.8)	1.0
Ca (mg)	447 ± 13.3 ( 60.0)	409.2 ± 32.3 ( 53.6)	417.4 ± 28.8 ( 55.3)	473.2 ± 30.0 ( 63.3)	437.2 ± 38.9 ( 57.3)	476.1 ± 24.2 ( 65.7)	1.2
Fe (mg)	10.7 ± 0.3 ( 73.8)	10.9 ± 0.7 ( 77.0)	9.5 ± 0.6 ( 64.3)	11.0 ± 0.6 ( 75.3)	12.2 ± 0.8 ( 80.7)	10.7 ± 0.5 ( 75.2)	2.0
Zn (mg)	7.8 ± 0.2 ( 71.1)	7.6 ± 0.6 ( 68.9)	7.1 ± 0.5 ( 66.6)	7.8 ± 0.6 ( 72.7)	8.8 ± 0.7 ( 81.8)	7.9 ± 0.5 ( 72.4)	1.0
Fiber (g)	4.5 ± 0.1	4.4 ± 0.3	4.3 ± 0.3	4.5 ± 0.3	4.7 ± 0.4	4.6 ± 0.2	0.3
Cholesterol (mg)	360.9 ± 17.9	345.9 ± 43.4	342.5 ± 38.7	357.7 ± 40.4	441.2 ± 52.3	353.4 ± 32.6	0.7

1) by ANOVA. None of variables were statistically significant by stages of change. 2) Mean ± SE(%RDA)

stage. In a study with university students (Chung 2004), maintainers to reduce fat consumption were only 7%, and those in the action stage were 28.7%. Oh et al. (2001) reported that about two-thirds of adults aged 30 and over were categorized into action or maintenance stage of fat reducing behavior. The percentages of those in the action or maintenance stage were slightly higher than that reported by Chung (2004), and much lower than that of Oh et al's study (Oh et al. 2000 ; Oh et al. 2001). These differences might suggest that university students like the fatty foods/ fast foods and they do not feel the need to reduce fatty foods than adults in general.

The frequency of fast food consumption was significantly different by stages of change, it was especially lower in the action or maintenance stage. The current study showed that stages of change model was useful in explaining nutrition behavior. Similarly, previous studies showed that dietary fat intake was significantly decreased or fiber intake was increased across the stages, as suggested by this model (Campbell et al. 1999 ; Greene et al. 1994 ; McDonnell et al. 1998 ; Van

Duyn et al. 1998).

In this study, there was no association between stages of change and general characteristics including age, sex, major, living status and pocket money, although we observed slight differences in general characteristics by stages of change. Previous studies reported the association of fast food consumption with demographics such as sex and living status. Fast food users were more likely to be female than male students (Han 1992 ; Shin, Roh 2000 ; You et al. 2000), and lived with family members (Shin, Roh 2000).

Stages of change were associated with perceived health status, interest toward health and exercising behavior in this study. It seemed that precontemplators compared with those in other stages (e.g., action or maintenance stage), rated their health as not good and were not interested in health matters. This suggested that educators might use motivational strategies for precontemplators by encouraging attending the health or nutrition information in a stimulating way.

With respect to health behaviors, about a quarter of subjects

participated in regular exercise, three-quarters were drinkers, and 18.8% were smokers in the current study. In a study with university students, Kim (2003) reported 21.5% for regular exercisers, 87.4% for drinkers, and 18.9% for smokers. According to the National Nutrition and Health Survey, regular exercisers among those aged 20 – 29 were 20% and drinkers were 86% (Ministry of Health and Welfare 2002). Compared to these studies, subjects in the current study were more involved in health behaviors. This study also revealed that stages of change in reducing fast food consumption were related to exercising behavior. This suggests that those who participate in desirable health behaviors are more likely to practice other health behaviors.

In this study, stages of change were associated with several behavioral beliefs regarding fast food consumption. Compared to subjects in the maintenance or action stage, those in the precontemplation through the preparation stages agreed more strongly regarding the advantages of eating fast foods, such as ‘taste’, ‘making me feel full’, ‘like the fast food restaurants (cleanness)’, and ‘diverse menus’. Previous studies found that reasons for eating fast foods were convenience and quickness in food service, taste, and for meals (Han 1992 ; Kim 1996 ; Lim 1997 ; Park et al. 1999 ; Yoon, Wi 1994 ; You et al. 2000). Taste was also related to the stages of change in nutrition behavior of fruit and vegetable intake (Van Duyn et al. 1998).

Precontemplators, compared to those in the maintenance, action or preparation stages were less likely to agree to the disadvantages of eating fast foods such as ‘fast foods are not sanitary/fresh’, ‘making me overeat’, ‘causing indigestion’, and ‘making me eat vegetable less’. As we expected, precontemplators felt more benefits and less disadvantages of eating fast foods than those in the maintenance or action stages. Similar to the current study, previous studies showed that perceived benefits or barriers clearly distinguished the people across the stages of change in fat reducing behaviors (McDonnell et al. 1998 ; Oh et al. 2000). The current study suggests that educational message for precontemplators or those in preaction stages (e.g., contemplators, preparers) focus on persuading them to realize nutritional and practical disadvantages of eating fast foods identified in this study (e.g., freshness, indigestion, overeating, eating less vegetables).

The scores for overall subjective normative items were decreased significantly across the stages. It seemed that those in the maintenance or action stage received more social pre-

ssure to reduce fast food consumption, while precontemplators did not. It was found that parents or relatives opposed subjects’ eating of fast foods, and the degree of social pressure of these groups was high in maintainers or contemplators. Fast foods are commonly consumed by adolescents or young adults (Park, Jun 2001 ; Sim, Kim 1993), while adults in general (e.g., parents, relatives) might not prefer fast foods based on food habits and do not recommend to eat fast foods to their children for nutritional concerns.

Friends or boy/girl friends were identified as important social groups that were related to stages of change. Lim et al. (2005) reported that friends, followed by families, had a significant influence on the consumption of convenience foods of university students. It was also reported that young adults or university students used fast food restaurants commonly with friends or boy/girl friend (You et al. 2000). In the current study, subjects especially precontemplators and contemplators, but excepting maintainers, received approval from friends or boy/girl friend regarding fast food consumption. This suggested that nutrition education for precontemplators or contemplators focus on eliciting support from friends or boy/girl friend to reduce fast food consumption, as well as seeking support from families. As stages of change were associated with the influence of written materials in this study, it is necessary to educate students to seek correct nutrition information from these sources including internet.

The differences in control beliefs were noticeable between maintainers and those in preaction stages (e.g., precontemplation, contemplation, preparation). This suggested that perceived control over reducing fast foods is quite important for those who are considering change as well as for precontemplators. McDonnell et al. (1998), in a study to examining stages of change in fat reducing behavior, also indicated that preparers felt several perceived barriers and suggested to deal with barriers (e.g., cooking skills, time constraints in preparing foods, social context of eating). Oh et al. (2000) also revealed that self-efficacy was higher in maintenance or action stages than in preaction stages.

The education program or messages should stress increasing perception of control over situations or factors that make it easy to eat fast foods, as identified in this study. For example, to deal with the belief of ‘fast foods provides standard meals (e.g., taste)’ or situations such as ‘when I do not have foods for meals’, ‘when I feel hungry’, and ‘when I do not like to cook/prepare meals’, educational strategies or mess-

ages could include cooking skills, preparing simple meals or snacks while less time is spent on cooking, and providing recipes for tasting and nutritious Korean-style fast foods.

The facilitators of fast food consumption also included 'because others (e.g., friends) like fast foods' and 'when others want to eat fast foods'. In nutrition education, it might be useful to involve friends and deal with skills of menu selection together. Factors such as availability of fast foods and advertisement were associated with stages of change, suggesting the importance of environmental influences. Park, Jun (2001) reported that fast food restaurants have increased rapidly and competitively during the past several years, reaching 2,660 restaurants in the year 2000.

Previous studies with university students (Chung 2004) or adults (Oh et al. 2000 ; Oh et al. 2001) reported that nutrient intakes such as energy and fat were significantly different across the stages of change. We also expected such differences ; however, there was no statistical significance in nutrient intakes across the stages of change in the current study. This might be partly attributed to the measurement specificity and dietary assessment methods. In this study, stages of change were measured regarding 'reducing fast food consumption'. Fast food consumption might explain some portions of energy and fat intakes, but it might not represent the whole or major part of these nutrient intakes in this population. In addition, we used 24-hour recalls for a day and it might not represent the usual intake of subjects, although we tried to measure dietary intakes as valid as possible using food models. In this study, those in precontemplation through preparation stage consumed less than the RDA for energy and other nutrients and this finding might not be interpreted as they do not need to reduce fast food consumption. They should meet the RDA for nutrients with balanced meals by eating a variety of foods.

In this study, the intakes of energy, calcium, iron, zinc and folic acid were insufficient, which was about or below the 75% of the RDA. Similar to this study, the recent National Health and Nutrition Survey revealed that calcium, iron, energy, vitamin A was below the RDA for adults in their twenties (Ministry of Health and Welfare 2002). The nutrient intakes of the current study were somewhat better than those of university students reported by Lee and Woo (2003).

In summary, this study showed that several factors, especially the specific beliefs were different by stages of change. This study suggested the need to consider one's stages of change in planning and implementing nutrition education for

behavior change. For those in preaction stages (first three stages), especially precontemplators, it is needed to use motivational strategies to realize disadvantages of eating fast foods and help them to lessen the perceived benefits of eating fast foods (e.g., taste, feeling full). Significant others such as friends and families need to be included in nutrition education to help the precontemplators to move forward to the other stages. Educational strategies or messages should also focus on increasing perception of control over situations or factors that make it easy to eat fast foods as found in this study. The strategies for perceived control should target for those in contemplators or preparers as well as precontemplators.

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## Summary and Conclusion

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This study was designed to examine stages of change to reduce fast food consumption, health related perceptions and behaviors, psychosocial factors related to fast food consumption, dietary intakes of university students, and to identify if these factors were different by stages of change.

1) Subjects were categorized into stages of change as follows : 17.0% for precontemplation, 21.4% for contemplation, 19.7% for preparation, 11.7% for action, and 30.2% for the maintenance stage. Subjects in the maintenance or action stage consumed fast foods less frequently than those in the precontemplation through preparation stages ( $p < 0.001$ ). However, general characteristics, such as age, sex, major, living status and pocket money were not significantly different across the stages of change.

2) Health related variables, such as perceived health status ( $p < 0.05$ ), interest toward health ( $p < 0.05$ ), and exercising behavior ( $p < 0.05$ ), were significantly different by stages of change. These differences were clearly seen between precontemplators and maintainers. Smoking, drinking behaviors and nutrient intakes including energy, fat and calcium were not significantly different by stages of change.

3) Nine behavioral beliefs out of 18 items were significantly different by stages of change. Those classified as precontemplation through preparation stage felt more strongly on the advantages of eating fast foods, such as 'tasting good' ( $p < 0.001$ ), 'making me feel full' ( $p < 0.001$ ), 'like fast food restaurants (cleanness)' ( $p < 0.01$ ), and 'diverse menus' ( $p < 0.05$ ). Stages of change were also related to the perceived disadvantages of eating fast foods, including 'fast foods are not sanitary' ( $p < 0.001$ ), 'making me overeat', 'causing me

have indigestion', 'making me eat vegetable less', 'fast foods are not fresh' ( $p < 0.01$ ). The differences in perceptions were more clearly found between precontemplators and maintainers.

4) Significant others or influences were related to stages of change. Especially the influence of boy/girl friend, friends, siblings, parents and relatives ( $p < 0.001$ ) were noticeable. The maintenance group received the least approval of fast food consumption from these sources, while the precontemplation group received more approval.

5) Twelve control beliefs out of 19 items were significantly different by stages of change. Those in preaction stages felt less control over eating fast foods, while those in maintenance felt more control. Facilitators for fast food consumption that differed by stages of change included availability issues, 'others like fast foods', 'standard meals (taste)' ( $p < 0.001$ ), and advertisement ( $p < 0.01$ ). Those in preaction stages also felt less control over eating fast foods in situations, 'when I do not have foods for meals' ( $p < 0.001$ ), 'when I feel hungry' ( $p < 0.01$ ), 'when I do not like to cook/prepare meals' and 'when others want to eat fast foods' ( $p < 0.05$ ).

6) This study suggested that nutrition education be planned considering one's stages of change. For those in preaction stages from precontemplation to preparation stages, especially for precontemplators, it is desirable to use motivational strategies to increase awareness of the nutritional problem, benefits or barriers of change. Significant others such as friends and families might be involved to help the precontemplators or contemplators to move to further stages. Educational strategies also need to focus on increasing perception of control over situations or factors that make it easy to eat fast foods. The strategies for perceived control should also target for those in contemplators or preparers as well as precontemplators.

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