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Social-Cognitive Predictors of Dietary Behaviors in South Korean Men and Women

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Background: *Eating a diet that is high in vitamins and low in fat is considered to be governed by social-cognitive factors, such as intentions, planning, self-efficacy, and outcome expectancies.* ***Purpose***: *A longitudinal field study was designed to examine the interrelationships of these factors with dietary behaviors.* ***Method***: *In 697 South Korean men and women, objective health-risk status was assessed at Time 1 (cholesterol, blood pressure, and body mass index) in conjunction with self-efficacy, outcome expectancies, and intentions. At Time 2, six months later, coping self-efficacy, planning, and dietary behaviors were measured. A two-group structural equation model for men and women was specified to determine the relations of distal and proximal predictors of a healthy diet.* ***Results***: *Self-efficacy was of equal predictive power in men and women, whereas intentions and planning were relevant only in women. Objective risk status was associated with intentions in women but not in men.* ***Conclusions***: *Results confirm the predictive power of the Health Action Process Approach and point to the role of gender in the self-regulation of dietary behaviors.*

Key words: intention, planning, risk, self-efficacy, nutrition

To maintain health and fitness, it is recommended to follow a diet that is low in saturated fats and high in vitamins by consuming, for example, 5 portions of fruit and vegetables per day (Hu & Willett, 2002; WHO, 2003). However, most individuals do not adhere to this health behavior, and many have not even contemplated adopting it (Jackson et al., 2005; Riebe et al., 2003).

Determinants of why people engage in health-promoting behaviors, such as a healthy diet, are described by social-cognitive health behavior models. The most prominent models are the Health Belief Model, the Theory of Planned Behavior, and the Protection Motivation Theory (for an overview and critique of these and other models, see Abraham & Sheeran, 2000; Renner & Schwarzer, 2003). These models share the assumption that the main predictor of health behaviors is the behavioral intention (e.g., "I intend to eat more vegetables"). But it is well known that people often do not behave in accordance with their intentions (Sheeran, 2002; Webb & Sheeran, 2006). For example, unforeseen barriers emerge and people give in to temptations, which compromise the translation of intentions into action. Some of these post-intentional factors have been identified, such as coping self-efficacy (Luszczynska & Schwarzer, 2003; Schwarzer & Renner, 2000), action planning (Gollwitzer & Brandstätter, 1997; Lippke, Ziegelmann, & Schwarzer, 2004), or action control (Sniehotta, Scholz, & Schwarzer, 2005). The present study examines the role that self-efficacy and planning play in the context of dietary behaviors, that is, eating a low-fat and high-vitamin diet.

Theoretical Constructs in Health Behavior Change

The Health Action Process Approach (HAPA; Lippke et al., 2004; Luszczynska & Schwarzer, 2003; Renner & Schwarzer, 2003, 2005; Schwarzer, 1992; Schwarzer & Renner, 2000; Sniehotta et al., 2005; Ziegelmann, Lippke, & Schwarzer, 2006) suggests a distinction between (a) pre-intentional motivation processes that lead to a behavioral intention, and (b) post-intentional volition processes that lead to the actual health behavior. Within both phases, different patterns

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of social-cognitive predictors may emerge. In the initial motivation phase, a person develops an intention to act. During this phase, risk perception is seen as a distal antecedent within the motivation phase. Risk perception in itself, however, is seen as insufficient to enable a person to form an intention. Rather, it sets the stage for a contemplation process and further elaboration of thoughts about consequences and competencies. Similarly, outcome expectancies ("If I eat healthful foods, I will reduce my cardiovascular risk") are chiefly seen as being important in the motivation phase, when a person balances the pros and cons of certain behavior consequences. Further, one needs to believe in one's capability to perform a desired action ("I am capable of controlling my diet in spite of sweet temptations"). Otherwise, one will fail to initiate action. Outcome expectancies operate in concert with perceived action self-efficacy, both of which contribute substantially to the forming of an intention. Both resources are needed, especially for implementing difficult or complex behaviors, such as dietary behaviors. After a person develops an inclination toward a particular health behavior, the "good intention" has to be transformed into detailed instructions on how to perform the desired action (action planning; see Gollwitzer, 1999). Once an action has been initiated, it has to be maintained. This is not achieved through a single act of will but involves self-regulatory strategies.

Phase-Specific Self-Efficacy Beliefs

The intention is typically seen as the best predictor of behavior, unless the post-intentional phase is further broken down into more proximal factors, such as planning and coping self-efficacy. In the following, these two constructs are explained in more detail.

Perceived self-efficacy has been found to be important at all stages or points in health behavior change (Bandura, 1997), but it is not always the same construct. The idea is to adjust the construct to the particular situation of individuals who may be more or less advanced in the change process. The concept of phase-specific self-efficacy has been brought up by Marlatt, Baer, and Quigley (1995) in the domain of addictive behaviors. They have distinguished between three phase-specific self-efficacy beliefs (i.e., action self-efficacy, coping self-efficacy, and recovery self-efficacy).

The rationale for the distinction between several phase-specific self-efficacy beliefs is that during the course of health behavior change, different tasks have to be mastered, and that different self-efficacy beliefs are required to master these tasks successfully. For example, a person might be confident in his or her capability to resist fatty foods (high action self-efficacy), but might not be very confident to stick to a healthy diet on a long-term basis when temptations arise (low coping self-efficacy). Action self-efficacy refers mainly to the first phase of the process, in which an individual does not yet act but develops a motivation to do so. Later, a health-related behavior needs to be initiated and maintained. Coping self-efficacy (Schwarzer & Renner, 2000; see also "maintenance self-efficacy," Luszczynska & Schwarzer, 2003) describes optimistic beliefs about one's capability to deal with barriers that arise during the maintenance period. A new health behavior might turn out to be much more difficult to adhere to than expected, but a self-efficacious person responds confidently with better strategies, more effort, and prolonged persistence to overcome such hurdles. This kind of self-efficacy refers to mobilizing resources to continue successful adoption. It also relates to anticipatory coping with relapse crises. Taken together, action self-efficacy refers to taking up an activity (motivational phase) and coping self-efficacy refers to maintaining the behavior (volitional phase). Thus, they represent two distinct aspects of self-efficacy that follow a temporal sequence. Accordingly, the HAPA model is conceptualized as a mediator model, whereby coping self-efficacy is assumed to mediate between action self-efficacy and behavior (see also Schwarzer & Renner, 2000). Supporting this notion, studies applying the HAPA model showed that action self-efficacy and coping self-efficacy differed in their effects on dietary behaviors (a diet low in fat and one high in vitamins) and on corresponding intentions (Renner & Schwarzer, 2005; Schwarzer & Renner, 2000). Action self-efficacy emerged as a significant predictor of intentions, whereas coping self-efficacy contributed to the prediction of eating a low-fat and high-vitamin diet.

Planning

Good intentions are more likely to be translated into action when people develop success scenarios and preparatory strategies of approaching the difficult task. Mental simulation helps to identify cues for action. The terms planning and implementation intentions have been used to address this phenomenon. Research on action plans has been suggested long ago. Leventhal, Singer, and Jones (1965) have stated that fear appeals can facilitate health behavior change only when combined with specific instructions on when, where, and how to perform them. Renewed attention to planning emerged when the concept of implementation intentions was introduced (Gollwitzer, 1999). Writing down when and where to eat healthy foods makes people more apt to eat such foods, compared with control persons who do not plan in such detail (Verplanken & Faes, 1999). Planning is more than simply an extension of the intention since it includes situation parameters ("when," "where") and a preprogrammed sequence of action ("how"). It is more effective than intentions when it comes to the likelihood of performance and speed of performance, mainly because the behavior is being elicited almost automatically when the relevant situational cues are encountered (Gollwitzer, 1999; Sniehotta, Schwarzer, Scholz, & Schüz, 2005). People also do not forget their intentions easily when specified in a when, where, and how manner (Armitage, 2004). Meta-analyses have revealed high population effect sizes for the planning-behavior relationship ($d+ = 0.70$; Sheeran, 2002). Therefore, the general emphasis of our study lies on the assumption that planning constitutes a valuable proximal construct by moving further into the volition phase and by allowing a better prediction of behaviors.

Objective Risk Status

Dietary behaviors are related to major risk factors for cardiovascular disease, such as high blood pressure, overweight and obesity, and high cholesterol (WHO, 2003). Various experimental and field studies showed that people with a high risk status (e.g., high cholesterol) perceive a higher pressure to act and are more inclined to form an intention than people who are not at risk (cf., Croyle, Sun, & Hart, 1997; Renner, 2004; Renner & Schwarzer, 2005). Moreover, the actual risk status is also related to perceived risk for future health problems and diseases. However, the relationship between current objective risk status and risk perception varies considerably, suggesting that they might contribute differently to intention forming. Therefore, in the present study, objective risk factors are specified as distal predictors of intentions and are considered to generate an indirect effect on subsequent volitional factors.

Dietary Behaviors in Korean Men and Women

South Korea has experienced various and rapid economic and sociodemographic changes during the past three decades. Related to these changes, a dramatic shift in the leading causes of death from infectious and parasitic diseases to cardiovascular diseases and cancer occurred in the 1970s (Kim, Moon, & Popkin, 2000). The transition in disease patterns from communicable to noncommunicable diseases, with cardiovascular diseases as the primary cause of death is, among other factors, due to changes in lifestyle and to a prolongation of average life expectancy (Lee, Popkin, & Kim, 2002). A poor diet is, among other lifestyle-related factors, such as physical inactivity, smoking, and alcohol consumption, one of the most important risk factors for developing cardiovascular diseases, diabetes, or obesity (WHO, 2003). The traditional Korean diet is low in fat and high in vegetables (Lee et al., 2002). Although there is a recent increase in the consumption of food products of animal origin and a decrease in total cereal intake, the amount of fat intake has remained low in Korea as opposed to other Asian countries (Kim et al., 2000). Consequently, the total prevalence of being overweight was only about 24% for men and women, and the prevalence of adult obesity was only 1.7% for men and 3.0% for women (data from 1998; Kim et al., 2000). However, the average body mass index (BMI) has increased steadily since the 1970s, whereby women show less of an increase than men (Lee & Sobal, 2003). As a result of socioeconomic changes, further transitions in dietary, nutritional, and body weight patterns are to be expected (Lee & Sobal, 2003). Hence, dietary behaviors that people engage in to promote or protect their health become increasingly important. The present study addresses gender differences in dietary behaviors and their motivational antecedents that might shed further light on such transitions.

The dietary practices of women are considered to be more healthful than those of men because they consume more fruit and vegetables (Baker & Wardle, 2003) and less red meat (e.g., Richardson, Shepherd, & Elliman, 1993). Women are also more often inclined to make dietary changes and to participate in purposeful weight control (Sobal & Maurer, 1999). In general, women experience more frequent food-related conflicts and more dissatisfaction with their body weight and shape than men do (Grogan, Bell, & Conner, 1997; Rolls, Fedoroff, & Guthrie, 1991). Research addressing gender differences in dietary behaviors has mainly addressed differences in the amounts or kinds of food consumed with a particular focus on eating disorders (e.g., Phan & Tylka, 2006). Other studies have examined differences in certain predictors of eating and drinking behaviors, for example, knowledge about food (Baker & Wardle, 2003) or differences in body image (Sakamaki, Amamoto, Mochida, Shinfuku, & Toyama, 2005). However, women appear also to be more health conscious and are more likely to change nutrition behaviors due to health-related concerns than men (Fagerli & Wandel, 1999). The consistent findings of gender differences in the amounts and kinds of foods consumed may therefore also reflect differences in health-related dietary self-regulation (Grogan et al., 1997; Resnicow et al., 1997; Wood Baker, Little, & Brownell, 2003). Analyzing gender differences in dietary behaviors from a health behavior theory perspective may therefore provide a key to understanding gender differences in food consumption.

Aims of the Study

This study is designed to apply the HAPA model to the prediction of dietary behaviors, that is, a diet low in fat and high in vitamins. The model includes three predictors of the intention to eat a healthy diet (action self-efficacy, outcome expectancies, objective health risk) and three predictors of self-reported nutrition behavior (intention, coping self-efficacy, planning). The analysis may partly replicate the Schwarzer and Renner (2000) study conducted with a German sample on the same topic, but the present study differs in three respects: (1) the study was conducted in South Korea, (2) it incorporates objective risk factors (body weight, blood pressure, cholesterol levels), and (3) it includes data on action planning.

The following research questions have been posed: (a) Does a structural equation model, specified in terms of the HAPA model but including objective risk status, fit the Korean data? (b) Do the two proximal predictors of dietary behaviors, planning, and coping self-efficacy emerge as mediators? In particular, does coping self-efficacy mediate the effects of action self-efficacy on planning and dietary behaviors? Does planning mediate the effects of the intention on dietary behaviors? (c) Does the model fit in the subsamples of men and women equally well and can structural parameters be constrained to be equal for men and women?

Method

Participants

Residents of Seoul and Kyungki-do, South Korea, were invited to participate in the first-wave data collection (Time 1). Volunteers were recruited from universities, homes for the elderly, clerical institutions, and police departments. The German Research Council (DFG) had approved and funded the project. All participants gave informed consent prior to the Time 1 assessment, and again prior to Time 2 assessment. Data collection took place in the context of the respective settings. Anonymity was assured, and identification of questionnaires was made possible by a code that was generated by the participants themselves. No compensation was offered. Participants were examined by medical staff (height, weight, systolic and diastolic blood pressure, total cholesterol), and afterwards they received a detailed questionnaire to assess the social-cognitive variables (action self-efficacy, outcome expectancies, intentions). Of 1,359 persons who participated at Time 697 were selected for the analysis who had completed another questionnaire at Time 2 six months later, which included coping self-efficacy, planning, and dietary behaviors. Within this final sample, 315 were men and 358 were women (24 participants did not indicate their sex and were therefore excluded from analyses). Average age was 32 years (SD = 17.5), with a range from 16 to 90 years. Average body weight was 61 kg (SD = 10.7), average height was 166 cm (SD = 9.4), total cholesterol level was 166 mm/dl (SD = 26), and average systolic blood pressure was 124 mm/Hg (SD = 16). In addition, 69% were single and 31% were married. One-third were university or college students, 14% homemakers, 6% were unemployed, about 10% were employed in white collar jobs, and the remaining 19% in blue collar jobs.

Attrition from Wave 1 to Wave 2 was 49% ($n = 662$; 368 women and 291 men; 3 participants did not indicate their sex and were therefore excluded from analyses), an amount that is typical for public health screenings on a voluntary basis (cf., Glanz & Gilboy, 1995). In order to investigate whether the longitudinal subsample was representative for the initial sample, the responses of the longitudinal sample ($n = 697$) were compared with the dropout sample ($n = 662$). The dropout sample was slightly older than the longitudinal sample (35.4 years versus 31.8 years, $t(1{,}357) = 4.0$, $p < 0.001$). No significant differences were found with regard to BMI, blood pressure, sex, outcome-expectancies, action self-efficacy, coping self efficacy, and planning. However, cholesterol levels and intentions to eat a healthy diet were slightly lower in the longitudinal sample ($p < 0.01$).

Measures

All items were adopted from Schwarzer and Renner (2000), except for planning, and translated from German into Korean by bilingual and bicultural individuals and native-language speakers and were verified through back translations (Behling & Law, 2000). All items were tested in a pilot study with respect to ambiguity, plausibility, and difficulty in order to reduce the frequency of invalid responses (cf., Clark & Watson, 1995).

Outcome Expectancies. Outcome expectancies were measured by six items (Cronbach's $\alpha = 0.79$). Participants were asked, "What do you think will be the consequences if you adopt a healthy diet?" After this header, responses were elicited to specific questions, such as: "If I eat healthy foods, then . . . (a) I would feel physically more attractive, or (b) it would be good for my blood pressure." Responses were made on 4-point scales ranging from 1 (*not at all*) to 4 (*exactly true*). The item examples in this section are translations from Korean to English.

Action Self-efficacy. For the assessment of perceived action self-efficacy at Time 1, the following three items were used: "How certain are you about being able to overcome the following barriers? I can manage to stick to a healthy diet . . . (a) . . . even if I have to learn much about nutrition, (b) . . . even if I have to watch out in many situations, or (c) . . . even if my blood pressure does not improve immediately." Responses were made on 4-point scales ranging from 1 (*not at all*) to 4 (*exactly true*).

Coping Self-efficacy. For the assessment of perceived coping self-efficacy at Time 2, the following

Table 1. *Descriptive Statistics for all Variables in the Model*

Variable	Item Example	Men		Women		t	p
		Mean	SD	Mean	SD		
Cholesterol		162.09	22.99	170.23	29.36	3.8	<.001
Systolic blood pressure		125.10	14.69	124.62	17.32	0.4	
Body mass index		22.91	3.13	22.28	4.63	1.95	
Outcome expectancies	If I eat healthy foods, then (positive).	2.67	0.69	2.92	0.62	4.6	<.001
Intention 1	I intend to eat as little fat as possible.	4.29	1.34	4.51	1.49	1.9	
Intention 2	I intend to eat healthy foods as much as possible.	3.37	1.68	3.59	1.63	1.6	
Self-efficacy 1	. . . even if I have to learn much about nutrition	2.54	0.83	2.66	0.81	1.8	
Self-efficacy 2	. . . even if I have to watch out in many situations	2.57	0.81	2.65	0.78	1.2	
Self-efficacy 3	. . . even if my blood pressure does not improve immediately	2.62	0.79	2.70	0.78	1.1	
Self-efficacy 4	. . . even if I have to start all over again several times until I succeed	2.56	0.76	2.50	0.79	0.9	
Self-efficacy 5	. . . even if I initially do not receive much support	2.63	0.78	2.56	0.79	1.1	
Self-efficacy 6	. . . even if it takes a long time to get used to it	2.60	0.79	2.56	0.77	0.5	
Planning 1	I have made a detailed plan regarding what to do in difficult situations in order to stick to my intentions.	2.32	0.83	2.40	0.86	1.0	
Planning 2	I have made a detailed plan regarding how to deal with relapses.	2.29	0.85	2.34	0.85	0.7	
High vitamin	I deliberately eat vitamin-rich foods.	2.41	0.60	2.71	0.60	5.9	<.001
Low fat	I avoid cholesterol-rich food.	2.32	0.53	2.64	0.57	6.9	<.001

three items were used: "How certain are you about being able to overcome the following barriers? I can manage to stick to a healthy diet . . . (a) . . . even if I have to start all over again several times until I succeed, (b) . . . even if I initially do not receive much support, or (c) . . . even if it takes a long time to get used to it." Responses were made on 4-point scales ranging from 1 (*not at all*) to 4 (*exactly true*).

Intentions. The intention to adopt a healthy diet was measured with two items, namely (a) "I intend to eat as little fat as possible (such as avoid fat meat, etc.)," and (b) "I intend to eat healthy foods as much as possible." Responses were made on 7-point scales ranging from 1 (*I don't intend to at all*) to 7 (*I strongly intend*).

Planning. For the assessment of planning, a two-item scale adopted from the planning scale by Sniehotta et al. (2005) was used. The item stem "I have made a detailed plan regarding. . . ." was followed by the items (a) ". . . what to do in difficult situations in order to stick to my intentions," and (b) ". . . how to deal with relapses." Responses were made on 4-point scales ranging from 1 (*not at all*) to 4 (*exactly true*).

Dietary Behavior. Dietary behavior was assessed with two brief scales. The first one (vitamin-rich) contains five items, such as (a) "I deliberately eat vitamin-rich foods," and (b) "I usually eat fresh greens." The second one (low fat) consists of four items, such as: (a) "I avoid cholesterol-rich food," and (b) "When I drink milk or eat milk products, I choose low-fat products (e.g., low-fat milk)." Responses were made on 4-point scales ranging from 1 (*not at all*) to 4 (*exactly true*).

Cholesterol and Blood Pressure. Trained laboratory assistants and medical doctors measured the blood pressure and the total cholesterol level using a fingerstick blood draw and a Reflotron (F. Hoffman-La Roche Ltd., Basel, Switzerland) desktop analyzer. Reflotron desk analyzers and nonfasting blood samples commonly yield total cholesterol measures with an accuracy and precision comparable to biochemistry laboratory results using fasting samples.

Weight, Height, and BMI. Weight and height measures were standardized (calibrated scales, regular clothing). The BMI was calculated as the weight in kilograms divided by the square of the height in meters (BMI = kg/m^2). Table 1 provides an overview of descriptive statistics for men and women at both points in time.

Analyses

The structural equation models were computed with AMOS 5 (Arbuckle, 2003). Treatment of missing values was done by the full information maximum

Table 2. *Loadings of the 16 Indicators on the 7 Factors (Loadings for Women in Parentheses)*

	Action Self-efficacy	Outcome Expectancy	Risk Perception	Intention	Coping Self-Efficacy	Planning	Dietary Behavior
Cholesterol			.52 (.65)				
Systolic blood pressure			.48 (.52)				
Body mass index			.44 (.57)				
Outcome expectancies		1.0 (1.0)					
Intention 1				.86 (.69)			
Intention 2				.71 (.74)			
Self-efficacy 1	.87 (.85)						
Self-efficacy 2	.90 (.91)						
Self-efficacy 3	.81 (.74)						
Self-efficacy 4					.81 (.77)		
Self-efficacy 5					.87 (.86)		
Self-efficacy 6					.82 (.79)		
Planning 1						.84 (.86)	
Planning 2						.88 (.87)	
High vitamin							.85 (.79)
Low fat							.90 (.77)

likelihood (FIML) method. The FIML approach is seen as a good way to compensate for missingness (Schafer & Graham, 2002). Most latent variables were based on multiple indicators, as described above and in Tables 1 and 2.

Results

Preliminary Analyses

Principal components analysis of all six self-efficacy items was computed, with eigenvalue >1 as the extraction criterion, yielding two components, three items for the action self-efficacy factor, and three items for the coping self-efficacy factor. Of the total variance, 80% was accounted for by this solution. Thus, the analysis has confirmed a two-factor solution attesting to the discriminant validity of the two phase-specific self-efficacy constructs. The intercorrelation of the two constructs was $r = 0.38$ ($p < 0.01$), indicating sufficient convergent validity to treat the variables as being of similar conceptual origin.

Table 1 compares men and women in terms of their mean levels and standard deviations for all variables. Women had higher total cholesterol ($\eta^2 = 0.15$) and higher positive outcome expectancies of a healthy diet ($\eta^2 = 0.19$), and they reported to consume more vitamins ($\eta^2 = 0.24$) and less fat ($\eta^2 = 0.28$). Men and women did not differ in terms of all other variables.

Examining the Two-Group Structural Equation Model for Men and Women

A structural equation model was specified with self-reported nutrition as the endogenous latent variable, intention, planning, and coping self-efficacy as mediators, objective risk status, outcome expectancies, and action self-efficacy as exogenous variables.

In order to investigate whether there were sex differences in the structure of social-cognitive variables, a sequence of nested models was examined. In the first step, the unconstrained model (Model 1) was tested. It reflects the extent to which the structure of the HAPA model fits the data when no cross-group constraints are imposed. Also, it provides the baseline against which subsequently specified models are compared. This unconstrained two-group model yielded a good fit to the data, $\chi^2 = 276$, $df = 188$, $p < 0.01$, $\chi^2/df = 1.47$, CFI = 0.97, TLI = 0.96, RMSEA = 0.03. Loadings are displayed in Table 2. The goodness of fit indices for the models with different constraints are summarized in Table 3.

In the second step, measurement invariance between groups was investigated. Thus, the question whether items assess the same constructs in men and women was examined. A common practice is to constrain the factor loadings to be equal across the samples (cf., Byrne, 2001). Accordingly, Model 2 constraining all factor loadings to be equal was tested against Model 1 that allowed the factor loadings to vary across subsamples. With a χ^2-difference value of 21.09 and $df = 9$ ($p < 0.02$), the assumption of invariance across groups was not confirmed. Then Model 2 was tested against Model 3, fixing all regression weights to be equal across groups. If the nested-model comparison suggests a significant difference between these two models, the patterns of social-cognitive variables between men and women could be regarded as being different. The results were significant, with a χ^2-difference value of 131.18 and $df = 32$ ($p < 0.001$), indicating structural differences in the prediction patterns of dietary behaviors between groups.

Since the two more constrained models did not improve the fit of Model 1 (see Table 3), it was concluded that the original unconstrained two-group model was

Table 3. *Goodness of Fit Indices for Nested Models*

Model	$\Delta\chi^2(df;p)$	χ^2	df	p	χ^2/df	CFI	TLI	RMSEA
Unconstrained (Model 1)		276.18	188	<.01	1.47	.97	.96	.03
Constrained factor loadings (Model 2)	21.09 (9; <.02)	297.28	197	< .01	1.51	.97	.96	.03
Constrained regression weights (Model 3)	131.18 (32; <.01)	407.36	220	< .01	1.85	.94	.93	.04

the most meaningful one, yielding different parameters for men and for women (see Figure 1 and Table 2). Figure 1 displays the standardized solution.

A large amount of variance was accounted for within the women's sample: 40% of nutrition, 38% of planning, and 28% of intention variance. In men, the corresponding amounts were 33% of nutrition, 25% of planning, and only 9% of intention variance. Inspection of the path coefficients reveals that coping self-efficacy was a strong predictor of nutrition in both subsamples (0.51, 0.45), and for planning as well (0.49, 0.42).

However, men and women differed in their intentional pathways. Women based their diet upon planning (0.28), and their planning was based upon intentions (0.41). Their intentions, in turn, were grounded in objective risk parameters (0.43). There was no relationship between objective risk factors and dietary intentions in men (0.02), a nonsignificant relation from intention to planning (0.09) and a significant but low association between planning and dietary behaviors (0.12). The two self-efficacy constructs were moderately related in line with the preliminary analyses (see above). Intention was predicted by action self-efficacy in both men (0.25) and women (0.19), but there was no prediction by positive outcome expectancies. Thus, the present analysis only elucidates the motivational phase for women, as 28% of the intention variance was accounted for, but it remains unclear how the intention levels of men were determined.

According to the HAPA model, phase-specific self-efficacy and strategic planning are supposed to act as mediators within the volition phase. Coping self-efficacy indeed emerged as a mediator for women (Sobel Z = 5.07, $p < 0.01$) and men (Sobel Z = 5.55, $p < 0.01$). Planning was a mediator within the women's sample (Sobel Z = 3.92, $p < 0.01$) and also within the men's sample, although slightly weaker (Sobel Z = 2.50, $p < 0.05$).

Discussion

The present findings contribute to our understanding of some mechanisms that are involved in health behavior change. The overall model fit the data, indicating that the HAPA model might be useful in describing the motivation to eat a healthy diet in non-Western cultures. The model, which so far has been studied mainly in European countries, has been

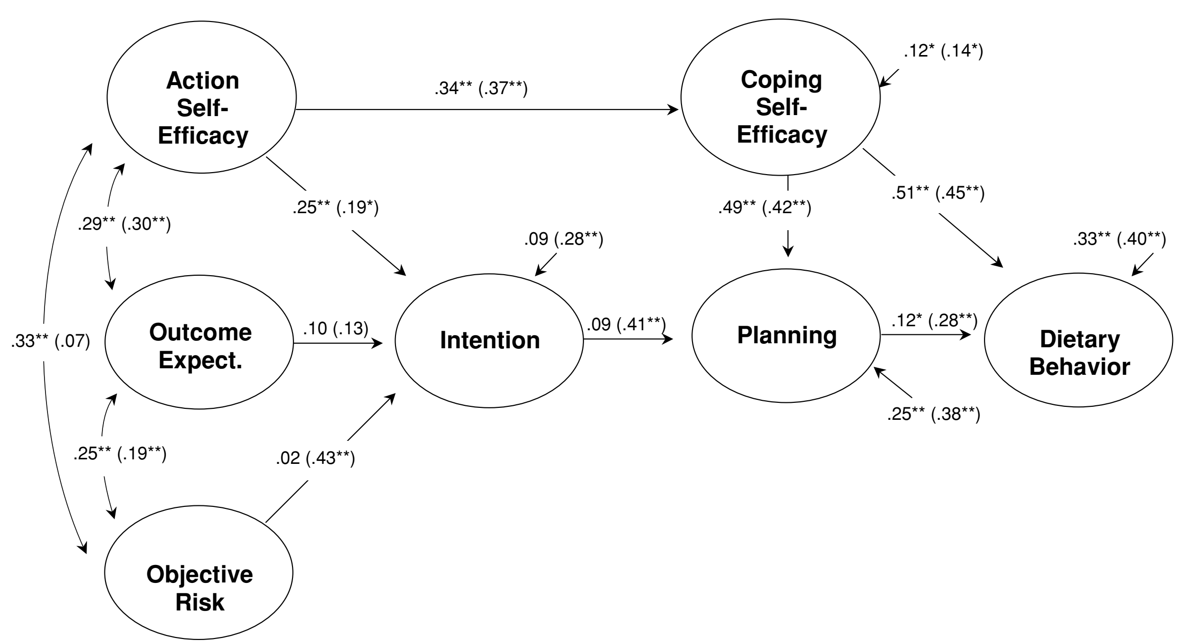

Figure 1. **Two-group prediction model for dietary behaviors in South Korean men and women (coefficients for women in parentheses).** ***Note:*** **Outcome Expect. = outcome expectancies, * $p < 0.05$, ** $p < 0.01$.**

found to be successful in predicting physical exercise (Lippke et al., 2004; Sniehotta et al., 2005; Ziegelmann et al., 2006), nutrition (Renner & Schwarzer, 2005; Schwarzer & Renner, 2000), and breast self-examination (Luszczynska & Schwarzer, 2003).

The traditional view, namely that intentions are the best predictors of behavior (Fishbein & Ajzen, 1975), has become increasingly questionable when findings like the present ones emerged. Post-intentional constructs seem to be appropriate to allow for a more direct prediction of behavior. To bridge the intention-behavior gap, self-efficacy and planning have been found useful (Lippke et al., 2004; Scholz, Sniehotta, & Schwarzer, 2005; Renner & Schwarzer, 2005, Schwarzer & Renner, 2000; Sniehotta et al., 2005; Ziegelmann et al., 2006). The present data underscore this position, particularly in favor of coping self-efficacy. The latter appeared to be the best direct predictor of a low-fat/high-vitamin diet among women and men. This is theoretically meaningful since intenders face unforeseen barriers and are challenged by temptations. One's confidence in being able to meet such demands motivates individuals to invest more effort and to persist longer when it comes to translating intentions into action. Coping self-efficacy is a proximal factor in the goal-attainment process.

It is also of note that South Korean women appear to demonstrate a somewhat different motivational structure than men when it comes to adhering to a low-fat/high-vitamin diet. Within the sample of women, the prediction pattern was characterized by a chain from objective risk via intention to planning. Accordingly, they seem to consider their personal health risks (blood pressure, cholesterol level, body weight) when developing an intention, and they translate their intentions into plans. This pathway was not found for men, indicating that men's dietary behaviors seem to be less directed by health-related concerns and health-related self-regulatory factors.

Interestingly, the results might also suggest that a greater knowledge and a higher health consciousness do not necessarily translate into a greater inclination to form an intention to change one's health behavior. In particular, women perceived substantially more positive outcome expectancies than men, but there was no differential gender effect of outcome expectancies on the subsequent intentional process that leads to eating a healthy diet. Thus, women appeared to be more health conscious and knowledgeable than men, but this did not evolve into a more favorable motivational mindset. One possible conclusion could be that the relationship between knowledge or health consciousness and a positive motivational inclination might be less articulate after reaching a certain knowledge threshold. The findings may also be related to the higher prevalence of adult obesity in women than in men (Kim et al., 2000). Being overweight might be more salient for women than for men, which may result in better knowledge of dietary consequences.

The fact that, in men only, objective risk was not significantly related to any of the variables under study, as opposed to the other social-cognitive variables, raises general questions about how health behaviors can be modified in such subsamples. In the previous study by Renner and Schwarzer (2005), it was found that objective risk predicted risk perception, but the latter did not translate into an intention to eat a healthy diet. Both the objective and subjective risk, may not be functional for health behavior change if not accompanied by other motivational factors (see also Leventhal et al., 1965). This has implications for interventions in particular subsamples. The fear appeal approach has focused on using risk communication to let people recognize how much they are at risk for illness or injury. The usefulness of such interventions as stand-alone strategies is doubtful at the least. The present findings would emphasize a different strategy by making people aware of their resources, that is, their skills and strategies (e.g., planning) to change a refractory behavior (Luszczynska, 2006; Renner & Schwarzer, 2003). One could also consider identifying possible different stages of change in men and women and tailoring interventions to the appropriate stage (Prochaska et al., 1994).

Some limitations need to be mentioned. The present analysis is based on longitudinal data, but we have not analyzed behavioral change. We studied only the relations between a baseline assessment of social-cognitive variables and, six months later, proximal volitional predictors along with dietary behaviors. Whether or not baseline behavior should be included in such an analysis is a matter of the research question. In all domains of human functioning, baseline behaviors are typically the best predictors of later behaviors, which means that their inclusion in the analysis would mask the effects of social-cognitive variables (Bandura, 1997). Baseline behaviors are themselves a product of previous social-cognitive behavioral processes that cannot be disentangled. Changes should be analyzed when interventions or critical events are at stake.

The criterion variable (healthy nutrition) is self-reported, and there is no direct possibility to examine the validity of these self-reports. However, in general, such self-reports have been found to be valid (Armitage & Conner, 2001).

The present study does not constitute a cross-cultural comparison. Although some of the findings might be unique to South Korean culture, we cannot conclude that there are cultural differences in health motivation or dietary behaviors. Such a conclusion would only result from studies in which representative samples from various nations are entered in formal multiple-group analyses. Multigroup comparisons of this model between cultures have not yet been performed and thus remain a task for the future. Speculations about the effects of unique cultural characteristics are therefore, premature.

In sum, the present analysis has demonstrated the applicability of the HAPA model in predicting dietary behaviors in a large South Korean sample, and it has unveiled gender differences that should be subject to further inquiry.

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