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*Britta Renner**
*Ralf Schwarzer***

The motivation to eat a healthy diet: How intenders and nonintenders differ in terms of risk perception, outcome expectancies, self-efficacy, and nutrition behavior

According to health behavior theories, health behaviors are governed by intentions and health beliefs, such as risk perception, outcome expectancies, and self-efficacy beliefs. The present study deals with the role that these factors play when it comes to adopting or maintaining a healthy diet. Moreover, objective parameters, such as age, gender, body weight, blood pressure, and total cholesterol, were considered. In a sample of 1,782 men and women between 14 and 87 years of age, it was found that risk perception was more closely related to objective parameters than to social-cognitive variables and self-reported nutrition. The intention to adhere to a healthier diet served as a mediator between self-efficacy, outcome expectancies, and risk perception on the one hand, and preventive nutrition on the other. In addition, intention was specified as a moderator, making a distinction between nonintenders and intenders. It turned out that these two groups were differently motivated to eat healthy foods.

***Keywords**: intention, risk perception, self-efficacy, outcome expectancies, nutrition, HAPA*

Preventive nutrition is an important health behavior that people should maintain, along with physical activity, for health, longevity, and fitness (WHO, 2003). A popular medical recommendation is to follow a healthy diet low in saturated fat and high in fiber. According to current medical knowledge, such nutrition helps to prevent diabetes, cardiovascular disease and other ailments (Hu & Willett, 2002). However, most individuals do not adhere to this health behavior, and many have not even contemplated adopting it (Riebe et al., 2003). The "Berlin Risk Appraisal and Health Motivation Study" (BRAHMS; Renner, Knoll, & Schwarzer, 2000; Schwarzer & Renner, 2000) was launched to examine the social-cognitive factors of health behavior change in various domains, such as physical exercise, smoking, alcohol consumption, and preventive nutrition. In the present analysis, the focus will be on preventive nutrition, examining to what degree nutrition-related beliefs are related to both intentions and objective health parameters, such as age, weight, blood pressure, and cholesterol level.

Most health behavior theories concentrate on the process leading to the formation of an explicit intention (e.g., "I intend to eat more vegetables") because they propose that a person's behavior is the outcome of conscious intentions. The *intention strength* is assumed to be the key indicator of cognitive preparedness for action, and Abraham and Sheeran (2000) expect behavioral intention measures to account for 20–25% of the variance in health behavior measures.

The process of intention formation is assumed to be determined by certain beliefs and attitudes

* International University Bremen, Germany
** Freie Universität Berlin, Germany

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Correspondence concerning this article should be addressed to Britta Renner, International University Bremen, Jacobs Center for Lifelong Learning and Institutional Development, Campus Ring 1, 28759 Bremen, Germany, e-mail: b.renner@iu-bremen.de

(Armitage & Conner, 2001; Fishbein & Ajzen, 1975). Therefore, in the past, the focus of health behavior models has been on identifying a parsimonious set of predictors that included constructs such as perceived barriers, social norms, disease severity, personal vulnerability, perceived self-efficacy, etc. These are then combined into a single prediction equation for explaining behavioral intention and individual health behavior change. Since this implies that the way in which these predictors combine to influence actions is expected to be the same for everyone, these models are also called *continuum models* (as opposed to stage models; see below). The most prominent approaches are the Theory of Reasoned Action, the Theory of Planned Behavior, and the Protection Motivation Theory (for an overview and critique of these and other models, see Abraham & Sheeran, 2000; Armitage & Conner, 2000; Rutter & Quine, 2002; Schwarzer, 1992).

An initial step in changing health behavior is to become aware of one's own risk. Therefore, risk information targeted at changing *risk perceptions* constitutes a first step in changing health behaviors. The processing of such information could be a complex task for recipients, which may result in severe pitfalls. Individuals might harbor erroneous beliefs about health risks, which could be due to missing information, misinformation, or inadequate or biased processing. Therefore, educational efforts must be sensitive to the psychology of people's decision making (Renner & Schwarzer, 2003). However, people not only need to be aware of a health threat, they also need enough knowledge about how to regulate their behavior. They need to understand the links between their actions and subsequent outcomes. These *outcome expectancies* can be the most influential beliefs in the motivation to change. A smoker may find more good reasons to quit ("If I quit smoking then my friend will like me much more") than good reasons to continue smoking ("If I quit smoking then I feel more nervous and tense"), and while this imbalance may not lead directly to action, it can facilitate generating the intention to quit. Positive and negative outcome expectancies represent perceived "pros" and "cons" for an envisaged behavior change that are typical in rational decision making.

The efficacy of taking precautions has to be distinguished from the belief in one's personal efficacy to change behaviors. *Perceived self-efficacy* portrays individuals' beliefs in their capabilities to exercise control over challenging demands and over their own functioning. According to Bandura (1997) perceived self-efficacy involves the regulation of thought processes, affective states, motivation, behavior, or changing environmental conditions. These beliefs are critical in approaching novel or difficult situations, or in adopting a strenuous self-regimen. People make an internal attribution in terms of personal competence when forecasting their behavior (e.g., "I am certain that I can quit smoking even if my friend continues to do so."). Such optimistic self-beliefs influence the goals people set for themselves, what courses of action they choose to pursue, how much effort they invest in given endeavors, and how long they persevere in the face of barriers and setbacks. Thus, the intention to change a habit that affects health is to some degree dependent on a firm belief in one's capability to exercise control over that habit.

In contrast to continuum models, stage models of health behavior change are based on the assumption that individuals move through discrete stages when adopting a health behavior. The idea of stage models can be seen as a heuristic to better understand that process and to identify individuals at certain points in their change process where interventions appear to be most promising. A parsimonious stage model is the Health Action Process Approach (HAPA; Luszczynska & Schwarzer, 2003; Renner & Schwarzer, 2003; Schwarzer, 1992; Schwarzer & Renner, 2000). It suggests a distinction between (a) preintentional motivation processes that lead to a behavioral intention, and (b) postintentional volition processes that lead to actual health behavior. Within both phases, different patterns of social-cognitive predictors may emerge. In the initial motivation phase, a person develops an intention to act. In this phase, risk perception ("I have a high risk of suffering a heart attack") is merely seen as a distal antecedent within the motivation phase. It may include not only the perceived severity of possible health threats, but also one's personal vulnerability to fall prey to them. Risk perception in itself is 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 nutrition in spite of sweet temptations"), otherwise one will fail to initiate action. Outcome expectancies operate in concert with perceived 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 preventive nutrition. After a person develops an inclination towards a particular health behavior, the 'good intention' has to be transformed into detailed instructions on how to perform the desired action (action planning; see Luszczynska & Schwarzer, 2003). 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 skills and strategies.

The present study attempts to elaborate upon some of these hypothesized relationships. The intention is a key variable in all current health behavior theories. It is seen as the best predictor of behavior, unless the postintentional phase is further broken down into more proximal factors such as action planning, initiative, etc. It will be examined to which degree the intention to adhere to a healthier diet can be predicted by the three social-cognitive factors, risk perception, outcome expectancies, and perceived self-efficacy. Moreover, objective health indicators will be considered, such as age, weight, blood pressure, and cholesterol levels. The question here is whether these objective variables are more closely related to behavior and intentions than the social-cognitive variables are. Theoretically, however, the influence of these objective variables has to be mediated by social-cognitive variables to become effective.

Extending previous studies, the present one examines behavioral intention not only as a continuum variable but also as a two-stage discrete variable. Thus, a distinction will be made between *nonintenders* and *intenders*. The research question here is whether, by creating such a dichotomy, one could realize a parsimonious approach to the hypothesized stage character of health behavior change. Stage models assume discontinuity of prediction patterns as people move through stages (Sutton, 2000). Thus, nonintenders in comparison to intenders should exhibit a different pattern of association strength with respect to the various social-cognitive variables. Treating the behavioral intention either as a continuum or as a dichotomy might further elucidate the disputed interrelationships of predictors.

Method

Participants

Residents of Berlin, Germany, were invited to four different locations (two universities and two city halls) to participate in the study. They were examined by medical staff (height, weight, systolic and diastolic blood pressure, total cholesterol). Afterwards, they received a detailed questionnaire that included items assessing social-cognitive variables and health behaviors. The questionnaire was completed at home anonymously and sent back in a self-addressed, stamped envelope. Of 2,549 persons who participated in the study, those were selected for the present analysis who had completed a questionnaire that included the social-cognitive variables and who had no missing values on the intention items (n=1,782). Within this final study sample, 41% were men (gender was coded as 1=men, 2=women). Average age was 39 years (SD=16) with a range from 14 to 87 years. A decomposition of the sample in terms of gender by age is given in Table 1.

Measures

Risk perception. Risk perceptions were obtained for each of the following four cardiovascular diseases: hypertension, heart disease, stroke, and heart attack. Participants were asked to estimate the likelihood of experiencing each particular health problem, for example, "How high do you think is your risk of becoming hypertensive during your life time?" The same judgment was asked for an average person of one's own age and gender (for example, "How likely do you think is it that someone else of your gender and age will become hypertensive during his/her life time?"). Responses were made on seven-point Likert scales ranging from –3 (*extremely unlikely*) to +3 (*extremely likely*). The perceived own risk was subtracted from the perceived risk of others for calculating an *indirect comparative risk score* (cf. Perloff & Fetzer, 1986) before an overall score was created (Cronbach's α=.79). Additionally, direct comparative risk judgments (Weinstein, 2003) were measured by asking: "Compared to other people – the same gender and age as yourself – what do you think are your chances of suffering a heart attack during your lifetime?" Responses were given on a seven-point Likert scale ranging from –3 (*much below average*) to +3 (*much above average*). Cronbach's alpha was considerably high, with α=.87. Both, the indirect comparative risk score and the direct comparative risk score correlated substantially (r=.48).

Outcome expectancies. Outcome expectancies were measured by three items (Cronbach's α=.82). Participants were asked, "What do you think will be the personal consequences for yourself if you adopt a low-fat diet?" After this header, responses were elicited to three specific questions: "If I stick to a low-fat, high-fiber diet, then... (a) I would feel physically more attractive, (b) I would feel better mentally, and (c) I would have no (or fewer) weight problems." Responses were made on four-point scales ranging from 1 (strongly disagree) to 4 (strongly agree).

Perceived self-efficacy. For the assessment of perceived self-efficacy, the following four items were used (Cronbach' α=.84): "How certain are

you about being able to overcome the following barriers? I can manage to stick to healthy food... (a) ...even if I have to make a detailed plan, (b) ...even if I have to rethink my entire way of nutrition, (c) ...even if I need a long time to develop the necessary routines, (d) ...even if I do not receive a great deal of support from others when making my first attempts." Responses were made on four-point scales ranging from 1 (strongly disagree) to 4 (strongly agree).

Intentions. The intention to adopt a healthy nutrition was measured with two items (r=.65), namely (a) "I intend to eat only a very low amount of fat (such as animal fat, cheese, butter) over the next months," and (b) "I intend to eat healthy foods over the next months." Responses were made on seven-point scales ranging from 1 (*I don't have this intention at all*) to 7 (*I do have this intention*).

Nutrition behavior. Nutrition behavior was assessed with six items related to a low-fat diet: (a) "I follow a low-fat diet," (b) "I am aware of my calorie intake," (c) "I avoid foods with cholesterol", (d) "I eat a lot of fresh fruit and vegetables," (e) "I observe a high vitamin diet," and (f) "I stick to a balanced diet" (Cronbach's α=.73). Responses were made on four-point scales ranging from 1 (*strongly disagree*) to 4 (*strongly agree*). Some evidence for validity of these measures is given by correlations with self-reported food intake frequencies, based on a weekly estimate of specific foods. For example, the low-fat diet sum score correlates r=–.20 with the frequency of consuming eggs, and r=–.25 with the frequency of eating sausages (all ps<.01). These correlations are in line with those of Armitage and Conner (1999). However, self-reported food intake frequencies are of limited value as a measure of preventive nutrition because the amount of food actually consumed is also influenced by body size, gender, age, and other factors, and the amount reported may not be recalled accurately over long periods of time (Renner, 2001).

Cholesterol and blood pressure. Total cholesterol and blood pressure were measured by medical staff. Results were given to participants along with advice on how to lower the levels, if necessary. The mean total cholesterol level was 217 (SD=47). Mean systolic blood pressure was 128 (SD=20), and mean diastolic blood pressure 78 (SD=11).

Weight, height, and body mass index. Weight and height measures were standardized (calibrated scales, regular clothing). The body mass index (BMI) was calculated as the weight in kilograms divided by the square of the height in meters (BMI = [kg/m^2]). Average BMI was 24.40 (SD=3.63, n=1,754). According to international standards (WHO, 2000), participants with a BMI over 24.9 were classified as being overweight, and those equal or below 24.9 as being of average weight. Table 1 displays the BMI by age and gender.

Analyses

The structural equation models were run with AMOS 4, using the maximum likelihood estimation procedure. Treatment of missing values in structural equation modeling was done by the full information maximum likelihood (FIML) method. The FIML approach is currently seen as the best way to compensate for missingness (Schafer & Graham, 2002). Latent variables were based on indicators at the item level, as described above.

Results

Objective measures and social-cognitive variables: The case of risk perception

To examine whether social-cognitive variables are related to objective parameters, the associations of perceived self-efficacy, outcome expectancies, risk perception, and intention with the available objective parameters were computed in a first step (see Table 2). The results showed that most correlations were of moderate to negligible size, except those including risk perception. Risk perception was substantially correlated with age (.30), BMI (.24), cholesterol level (.38), and systolic (.31) and diastolic (.24) blood pressure.

To further explore the predictability of risk perception, a structural equation model was

Table 1
Body Mass Index for age by gender

	Men			Women		
Age groups	Mean	*SD*	*n*	Mean	*SD*	*n*
< 31 years	22.96	2.57	221	22.28	3.04	452
31–40 years	25.60	3.79	115	23.70	3.85	190
41–50 years	26.68	3.32	125	25.56	3.81	131
51–60 years	26.34	3.11	146	25.18	3.48	148
> 60 years	27.23	2.74	117	26.17	3.82	109

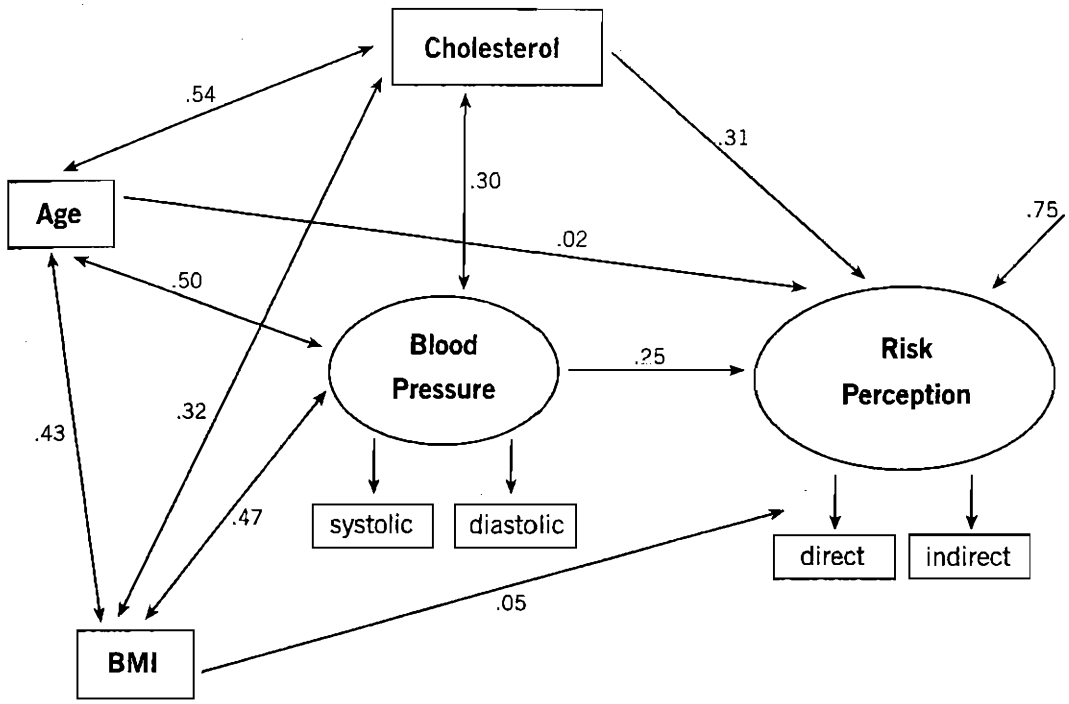

Figure 1. Objective parameters as predictors of risk perception.

specified, with risk perception as the endogenous latent variable, and age, BMI, cholesterol level, or blood pressure as exogenous variables. The latter variables were specified as being intercorrelated (oblique model). The model yielded a good fit, χ^2=48.98, *df*=7, GFI=.99, RMSEA .05. Twenty-five percent of the variation of risk perception was accounted for by the present set of predictors. Figure 1 displays the standardized solution. After accounting for the intercorrelation among the predictors, only cholesterol level and blood pressure remained as direct predictors of risk perception.

The same model was tested with outcome expectancies, perceived self-efficacy, intention, and self-reported nutrition behaviors instead of risk perception as the endogenous latent variable. All models were rejected because almost no variance of the criterion had been accounted for. Thus, the assessed objective parameters clearly predicted perceived risk, indicating that participants being at higher risk felt more vulnerable than those being at lower risk. Conversely, objective parameters did not predict outcome expectancies, perceived self-efficacy, behavioral intention, or self-reported nutrition.

Intention as a mediator between social-cognitive predictors and behavior

Since intention and self-reported nutrition could not be predicted very well by the assessed objective parameters, it was examined, in a next step, to which degree intention and self-reported nutrition can be predicted by the social-cognitive variables, namely risk perception, outcome expectancies, and perceived self-efficacy.

A structural equation model was specified with self-reported nutrition as the endogenous latent variable, intention as the mediator, and risk

Table 2
Correlations of objective parameters with risk perception, outcome expectancies, self-efficacy nutritional intention, and preventive nutrition

Variables	Risk perception	Outcome expectancies	Self-efficacy	Nutritional intention	Preventive nutrition
Age	.30*	.14*	.08*	.16*	.29*
Sex	-.09*	.12*	-.03	.08*	.21*
Body Mass Index	.24*	.28*	.00	.13*	.08*
Cholesterol	.38*	.09*	.08*	.16*	.18*
Systolic blood pressure	.31*	.08*	.10*	.11*	.11*
Diastolic blood pressure	.24*	.04	.04	.07*	.06

* $p<.05$.

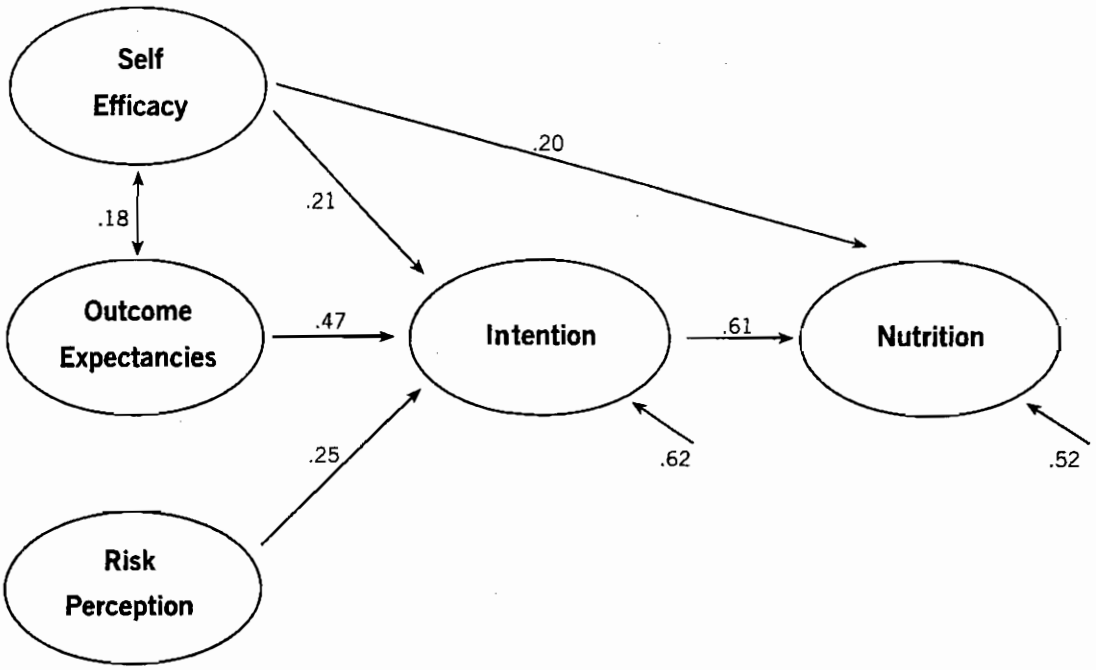

Figure 2. Intention as a mediator between social-cognitive antecedents and self-reported nutrition behavior.

perception, outcome expectancies, and perceived self-efficacy as exogenous variables. The latter were specified as being intercorrelated (oblique model). The model yielded a good fit, $\chi^2=466$, $df=82$, GFI=.99, RMSEA=.05. Forty-eight percent of the variation of self-reported nutrition behavior was accounted for by the present set of predictors. Figure 2 displays the standardized solution. Nutrition behavior is well-predicted by the corresponding intention, and intention itself is predicted jointly by the three social-cognitive variables. Obviously, individuals base their intentions mainly on outcome expectancies, and, secondary, on self-efficacy and risk perception. The latter, in turn, is being influenced by objective health risk data as demonstrated above in Figure 1.

According to the HAPA model, an additional path has been specified, leading from self-efficacy directly to the behavior. Self-efficacy continues to be of influence after an intention has been formed (Luszczynska & Schwarzer, 2003; Schwarzer & Renner, 2000). In other words, self-efficacy operates as a postintentional factor that exerts its influence in the self-regulation process of health behavior change, whereas outcome expectancies and risk perception operate primarily within the motivation phase and seem to lose their importance later on.

A stage approach: Comparing non-intenders with Intenders

The above analyses followed the standard design in this line of research. The underlying assumption was that intention is best treated as a continuous variable, and that all relationships are linear ones. An alternative way is to see the intention as a turning point where motivation ends and volition begins. Thus, a sample can be divided into nonintenders and intenders. Here, the assumption is that individuals move through stages when changing health behaviors. As a consequence, intenders should be described by different characteristics than nonintenders. First, they should be closer to action and, therefore, should report higher levels of the desired behavior. Second, their nutrition behavior should be differently determined, that is, intenders should eat a healthy diet for different reasons than nonintenders do. In the following section, this is more closely inspected.

In order to examine this line of reasoning, two extreme groups of nonintenders and intenders were established. The group of nonintenders ($n=330$) was created by combing the first three response categories of the seven-point intention score. The group of intenders ($n=752$) was created by combing the last two response categories. A comparison of the two groups confirmed the behavioral difference between nonintenders and intenders. Figure 3 compares the groups in terms of six favorable nutrition behaviors. Intenders report a healthier diet than nonintenders. All mean differences are significant, $p<.01$.

The next question was whether healthy nutrition within the group of intenders is motivated differently than within the group of nonintenders. As seen above, both groups eat to some degree healthful foods. However, intenders adhere to a higher level of preventive nutrition. Moreover, people might eat in a comparable

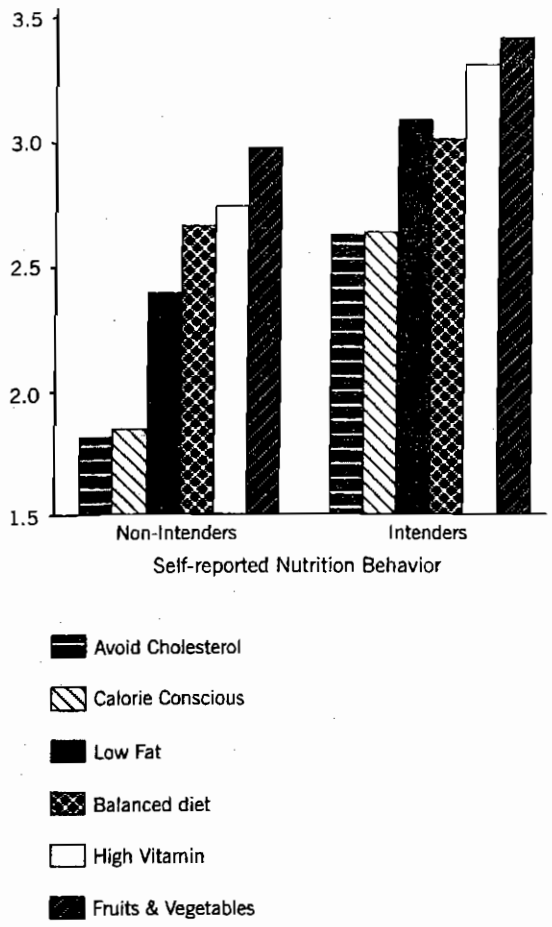

Figure 3. Differences in self-reported nutrition behavior between nonintenders and intenders.

healthy way but for different reasons. To examine this line of reasoning further, the three social-cognitive predictors, namely risk perception, outcome expectancies, and perceived self-efficacy were specified as being directly related to preventive nutrition. For both groups of intenders and nonintenders, the same structural equation model was specified. Thus, intention was used as a moderator variable. Focusing on the *group of nonintenders* (n=330), the analysis yielded a satisfactory fit, χ^2=121, df=59, GFI=.99, RMSEA =.057. Thirty-two percent of the variation of behavior is accounted for by the present set of predictors. Figure 4 displays the standardized solution. Healthy nutrition is not at all related to risk perception but mainly to outcome expectancies and to a lesser, but significant degree to perceived self-efficacy.

For the *group of intenders* (n=752), the analysis yielded also a good fit, χ^2=163, df=59, GFI=.99, RMSEA=.049. Twenty-five percent of the variation of behavior is accounted for by the present set of predictors. Figure 4 displays the standardized solution in parentheses. In the case of intenders, healthy nutrition is equally governed by outcome expectancies and self-efficacy. Moreover, and in contrast to the group of nonintenders, there is also a significant path from risk perception to behavior.

Obviously, there are different prediction patterns for the groups of nonintenders and intenders. This raises the question as to whether there are also mean differences in risk perception, outcome expectancies, and perceived self-efficacy.

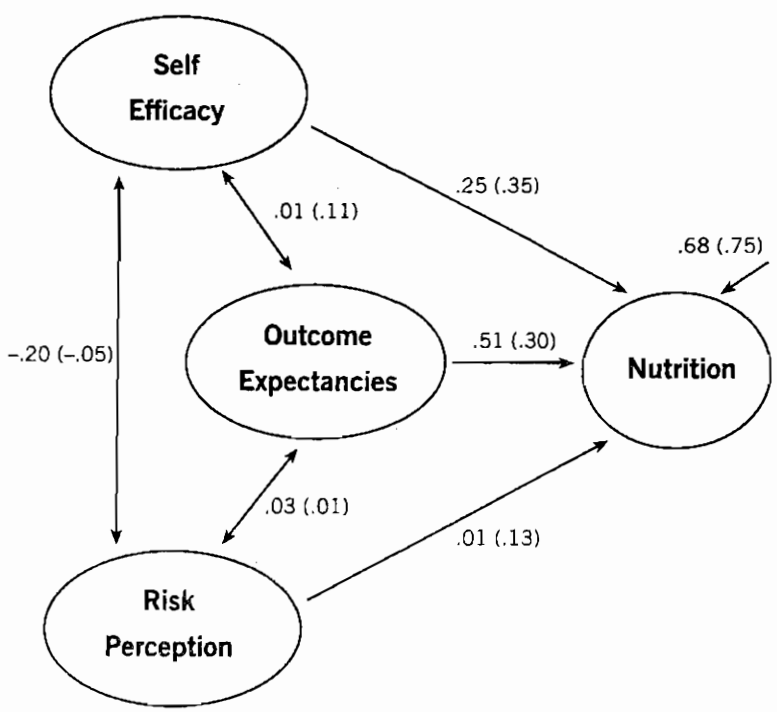

Figure 4. Prediction of self-reported nutrition behavior for nonintenders and for intenders (in parentheses).

To examine this issue, a separate analysis of variance was computed for each of these variables. For *risk perception*, the two groups differed significantly, $F(1, 676) = 23.11$; $p<.001$, $\eta^2=.03$. Low intenders had a mean of 6.6 ($SD=1.9$, $n=164$), high intenders of 7.5 ($SD=2.3$, $n=514$). The same finding emerged for *outcome expectancies*, $F(1, 1046)=219.09$, $p<.001$, $\eta^2=.17$; low intenders had a mean of 6.3 ($SD=2.5$, $n=322$), high intenders of 8.9 ($SD=2.6$, $n=7$ 26), and for *nutrition self-efficacy*, $F(1, 1035)=58.55$, $p<.001$, $\eta^2=.05$; low intenders had a mean of 12.9 ($SD=3.6$, $n=315$), high intenders of 14.7 ($SD=3.3$, $n=722$). These findings demonstrate that all three social-cognitive variables were more pronounced within the group of intenders than within the group of nonintenders.

Discussion

Participants' risk perception was clearly related to objective parameters. The higher their cholesterol level and blood pressure, the more they felt at risk. Hence, people seem to acknowledge their personal health risks. However, risk perception did not directly transform into behavior. For that purpose, other social-cognitive variables are instrumental, such as outcome expectancies and perceived self-efficacy (Bandura, 1997). In the present overall causal model that included all 1,782 participants, nutritional intention was well predicted (38%) jointly by these social-cognitive variables. Reported eating behavior, in turn, was very well predicted (48%) by the intention, along with self-efficacy. Thus, the results support the assumption that objective risk parameters do not directly translate into behavior, but need to be mediated by social-cognitive variables. These variables, however, are in turn themselves mediated by behavioral intentions.

Extending previous studies, the present one examined the intention not only as a continuous variable, but also as a categorical variable. The distinction between nonintenders and intenders, although simple, sheds some light on the relationships among the chosen variables. It does not come as a surprise that nonintenders report on average lower levels of healthy nutrition than intenders. More interestingly, however, nonintenders have also lower mean scores of risk perception, outcome expectancies, and perceived nutrition self-efficacy, which underscores that they have less progressed through the change process. Moreover, within the group of nonintenders, healthy nutrition is well explained (32%) by outcome expectancies, followed by self-efficacy, but not at all by risk perception. Thus, nonintenders who reported a comparable healthy nutrition seem not to feel very much at risk for heart disease, and if so, this is not at all related to their nutrition style. Thus, they might eat less fat and more fiber predominantly in order to feel more attractive, control their weight, and feel mentally better. Within the group of intenders, the variations in nutrition behaviors are somewhat less well accounted for by the three social-cognitive predictors (25%), but are still considerable. More importantly, intenders exhibited in comparison to nonintenders a different pattern of association strength with respect to the social-cognitive variables. Particularly, perceived self-efficacy and outcome expectancies are equally closely related to preventive nutrition. Moreover, risk perception also plays a role albeit to a lesser degree. Since intenders also have higher mean risk-perception scores in comparison to nonintenders, they appear to partake of their diet for particular health reasons. However, health may be just one reason among others. Social motives, access to foods, constraints in choice, and so on may also have a strong influence on nutrition. However, these aspects have not been the focus of the present study.

Some further limitations need to be mentioned. The present analysis is based on cross-sectional data, which does not allow a description of the health behavior change process. The criterion variable (healthy nutrition) is self-reported, so there is no possibility to examine the validity of these self-reports. However, some objective parameters are also included in the study that have plausible associations with the self-reported data. Due to the rough distinction made here, the group of intenders also includes those who have practiced healthy nutrition for years and who are no longer considered to be in a health-behavior change process. This may partly explain why the present model accounted for less variance in nutrition behavior within the group of intenders than in the group of non-intenders. On the other hand, the group of nonintenders includes those who are struggling with the goal of changing behavior as well as those who don't even have the slightest intention to do so. Therefore, the intention construct does not cover the different stages that might characterize the change process. More complex staging algorithms are needed to address this issue.

References

Abraham, C., & Sheeran, P. (2000). Understanding and changing health behavior: From health beliefs to self-regulation. In: P. Norman, C. Abraham, & M. Conner (Eds.), *Understanding and changing health behavior* (pp. 3–24). Amsterdam: Harwood Academic Publishers.

Armitage, C. J., & Conner, M. (1999). Distinguishing perceptions of control from self-efficacy: Predicting consumption of a low-fat diet using the theory of planned behavior. *Journal of Applied Social Psychology*, 29, 72–90.

Armitage, C. J., & Conner, M. (2000). Social cognition models and health behaviour. *Psychology and Health*, 15, 173–189.

Armitage, C. J., & Conner, M. (2001). Efficacy of the theory of planned behaviour: A meta-analytic review. *British Journal of Social Psychology*, 40, 471–499.

Bandura, A. (1997). *Self-efficacy: The exercise of control*. New York: Freeman.

Fishbein, M., & Ajzen, I. (1975). *Belief, attitude, intention, and behavior: An introduction to theory and research*. Reading, MA: Addison-Wesley.

Hu, F. B., & Willett, W. C. (2002). Optimal diets for prevention of coronary heart disease. *Journal of the American Medical Association*, 288, 2569–2578.

Luszczynska, A., & Schwarzer, R. (2003). Planning and self-efficacy in the adoption and maintenance of breast self-examination: A longitudinal study on self-regulatory cognitions. *Psychology and Health*, 18, 93–108.

Perloff, L. S., & Fetzer, B. K. (1986). Self-other judgments and perceived vulnerability to victimization. *Journal of Personality and Social Psychology*, 50, 502–510.

Renner, B. (2001). Assessment of health behaviors. In: N. J. Smelser & P. B. Baltes (Eds.), *The international encyclopedia of the social and behavioral sciences* (Vol. 10, pp. 6512–6515). Oxford, England: Elsevier.

Renner, B., Knoll, N., & Schwarzer, R. (2000). Age and body weight make a difference in optimistic health beliefs and nutrition behaviors. *International Journal of Behavioral Medicine*, 7, 143–159.

Renner, B., & Schwarzer, R. (2003). Social-cognitive factors in health behavior change. In: J. Suls, & K. Wallston (Eds.), *Social psychological foundations of health and illness* (pp. 169–196). Oxford, England: Blackwell.

Riebe, D., Greene, G. W., Ruggiero, L., Stilwell, K. M., Blissmer, B., Nigg, C. R., & Caldwell, M. (2003). Evaluation of a healthy-lifestyle approach to weight management. *Preventive Medicine*, 36, 45–54.

Rutter, D., & Quine, L. (2002). Social cognition models and changing health behaviours. In: D. Rutter & L. Quine (Eds.), *Changing health behaviour: Intervention and research with social cognition models* (pp. 1–27). Buckingham, England: Open University Press.

Schafer, J. L., & Graham, J. W. (2002). Missing data: Our view of the state of the art. *Psychological Methods*, 7, 147–177.

Schwarzer, R. (1992). Self-efficacy in the adoption and maintenance of health behaviors: Theoretical approaches and a new model. In: R. Schwarzer (Ed.), *Self-efficacy: Thought control of action* (pp. 217–243). Washington, DC: Hemisphere.

Schwarzer, R., & Renner, B. (2000). Social-cognitive predictors of health behavior: Action self-efficacy and coping self-efficacy. *Health Psychology*, 19, 487–495.

Sutton, S. (2000). A critical review of the transtheoretical model applied to smoking cessation. In: P. Norman, C. Abraham, & M. Conner (Eds.), *Understanding and changing health behavior* (pp. 207–225). Amsterdam: Harwood Academic Publishers.

Weinstein, N. D. (2003). Exploring the links between risk perceptions and preventive health behavior. In: J. Suls & K. Wallston (Eds.), *Social psychological foundations of health and illness* (pp. 22–53). Oxford, England: Blackwell.

WHO (2000). Obesity: Preventing and managing the global epidemic. *World Health Organization Technical Reports Series*, No. 894. Geneva, Switzerland: World Health Organization.

WHO (2003). Diet, nutrition, and the prevention of chronic diseases. *World Health Organization Technical Reports Series 916*. Geneva, Switzerland: World Health Organization.