How to Overcome Health-Compromising Behaviors

The Health Action Process Approach

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Abstract. Health-compromising behaviors such as cigarette smoking and poor dietary habits are difficult to change. Most social-cognitive theories assume that the intention to change is the best predictor of actual change, but people often do not behave in accordance with their intentions. Unforeseen barriers emerge, or people give in to temptations. Therefore, intentions should be supplemented by more proximal predictors that might facilitate the translation of intentions into action. Some self-regulatory mediators have been identified, such as perceived self-efficacy and strategic planning. They help to bridge the intention-behavior gap. The Health Action Process Approach (HAPA) suggests a distinction between (1) a preintentional motivation process that leads to a behavioral intention and (2) a postintentional volition process that facilitates the adoption and maintenance of health behaviors. In this article, two studies are reported that examine mediators between intentions and two behaviors. One behavior is smoking reduction in young adults, the other is dietary restraint in overweight patients with chronic disease. A structural equation model, specified in terms of the HAPA, was in line with both data sets but it explained more variance of dietary behaviors among middle-aged or older individuals with a health condition whereas variance of smoking reduction in healthy young adults was less well accounted for. The findings contribute to the elucidation of psychological mechanisms in health behavior change and point to the particular role of mediator variables.

Keywords: health behavior, self-efficacy, planning, intention, smoking, diet, obesity

Many health conditions are caused by risk behaviors such as problem drinking, substance use, smoking, reckless driving, overeating, or unprotected sexual intercourse. Fortunately, human beings have, in principle, control over their conduct. Health-compromising behaviors can be overcome by self-regulatory efforts, and health-enhancing behaviors can be adopted instead, such as nonsmoking, physical exercise, weight control, preventive nutrition, dental hygiene, condom use, or accident prevention. Health behavior change refers to the motivational, volitional, and actional processes of abandoning such health-compromising behaviors in favor of adopting and maintaining health-enhancing behaviors. It encompasses a variety of social, emotional, and cognitive factors. Some of these determinants are assumed to operate in concert. Therefore, researchers have aimed at identifying the optimal set of factors that allow for the best prediction or explanation of health behavior change. Such models or theories are subject to debate in health psychology. For example, which model is the most parsimonious one and allows for the best prediction of regular condom use? From which model can we derive interventions to modify refractory dietary risk behaviors? Which model suggests a good policy to promote smoking cessation at the workplace?

The currently preferred models of health behavior change overlap in terms of some of the crucial factors, but there are also major differences in terms of the underlying philosophy. This article examines the utility of one such model, the Health Action Process Approach (HAPA) that is supposed to overcome some of the limitations inherent in other models.

Theories of Health Behavior Change

Models of health behavior change postulate a pattern of factors that may improve motivation and, thus, eventually lead to sustained behavior change. A distinction is made between continuum models and stage models. In continuum models, individuals are placed along a range that reflects the likelihood of action. Such models assume that a person's behavior is the outcome of an intention (e.g., "I intend to quit smoking next week"). Intention forming is seen as being determined by beliefs and attitudes (Fishbein & Ajzen, 1975). Therefore, the focus is on identifying a parsimonious set of predictors that includes constructs such as perceived barriers, social norms, disease severity, personal vulnerability, or perceived self-efficacy. These are then combined into a prediction equation for explaining behavioral intention and behavior change. The most prom-

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inent approaches of this kind are the theory of reasoned action, the theory of planned behavior, and protection motivation theory (for an overview, see Abraham & Sheeran, 2000; Armitage & Conner, 2000; Conner & Sparks, 2005; Sutton, 2005; Weinstein, 2007).

Researchers have pointed out two major deficiencies of continuum models. First, a single-prediction rule for describing behavior change implies that cognitive and behavioral changes occur in a linear fashion, and that a "one-size-fits-all" intervention approach is suitable for all individuals engaging in unhealthy behaviors. The goal of an intervention is to move the individual along this route toward action. Consequently, it excludes qualitative changes during the course of time, such as changing mindsets, phase transitions, or recycling back and forth. According to continuum models, it is not important whether an intervention approach is targeted first toward changing perceived vulnerability, perceived consequences, or perceived self-efficacy. Hence, interventions are not required to progress in any certain sequence, but could be applied in any order, or even simultaneously. Second, a general weakness of continuum models is that they account for intention variance better than for behavior variance. They do not include a postintentional phase in which goals are translated into action. The segment between intentions and behaviors is a black box that is often called the *intention-behavior gap* (Sheeran, 2002). However, it is quite common that people do not behave in accordance with their intentions. For example, unforeseen barriers emerge, and people give in to temptations. In a postintentional phase, various factors can compromise or facilitate the translation of intentions into action. Some of these postintentional factors have been identified such as maintenance self-efficacy and recovery self-efficacy (Luszczynska & Schwarzer, 2003, 2005; Scholz, Sniehotta, & Schwarzer, 2005) as well as action planning (Lippke, Ziegelmann, & Schwarzer, 2004; Luszczynska, Sobczyk, & Abraham, 2007; Sniehotta, Scholz, & Schwarzer, 2005). It has been suggested identifying factors may help to bridge the intention-behavior gap. In doing so, it is implicitly assumed that there are at least two sequential processes of behavior change, a motivational one that ends with an intention and a volitional one that ends with successful performance. Theorizing about health behavior change should not be reduced to the initial motivation phase only, while omitting the subsequent volition phase that becomes more decisive for actual behavior change.

To overcome the limitations of continuum models, stage theorists have made an attempt to consider process characteristics by proposing that individuals pass through qualitative stages. The transtheoretical model of behavior change (TTM; e.g., DiClemente & Prochaska, 1982; Prochaska & DiClemente, 1983; Prochaska DiClemente, & Norcross, 1992; Velicer, Prochaska, & Redding, 2006), for example, has become the most popular stage model. It implies that different interventions are appropriate at different stages of health behavior change. The most common version of the TTM includes five discrete stages of health behavior change that are defined in terms of one's past behavior and future goals (precontemplation, contemplation, preparation, action, maintenance). Time frames provide the basis for operational stage definitions (such as intending to quit within 30 days). Stage models have also been criticized (West, 2005). Sutton (2005) argues that the notion of stages might be flawed or circular, in that the stages are not genuinely qualitative, but are arbitrary subdivisions of a continuous process. In particular, the proposed time frames for distinguishing between different qualitative stages are not conclusive.

The Health Action Process Approach

A model that explicitly includes postintentional mediators to overcome the intention-behavior gap is the HAPA (Schwarzer, 1992). It was originally developed in the late 1980s (Schwarzer, 1992) by integrating social-cognitive theory (Bandura, 1986), the theory of reasoned action (Fishbein & Ajzen, 1975), and the volition theories of Heckhausen, Gollwitzer, and Kuhl (Heckhausen, 1991; Heckhausen, & Gollwitzer, 1987; Kuhl, 1983, 1985, 1987), and by applying this synthesis to the field of health behavior change. Since then a great deal of empirical evidence has been accumulated that supports the assumptions of the model (for example, Lippke et al., 2004; Luszczynska & Schwarzer, 2003; Schwarzer et al., 2007; Sniehotta et al., 2005; Ziegelmann, Luszczynska, Lippke, & Schwarzer, 2007). This approach suggests a distinction between (1) preintentional motivation processes that lead to a behavioral intention and (2) postintentional volition processes that lead to the actual health behavior. Within the two phases or "stages," different patterns of social-cognitive predictors may emerge. In the initial motivation phase, a person develops an intention to act. Within this first phase, risk perception is seen as a distal antecedent (e.g., "I am at risk for cardiovascular disease"). Risk perception alone is insufficient to enable a person to form an intention. Rather, it may set the stage for a further elaboration of thoughts about consequences and competencies. Similarly, positive outcome expectancies (e.g., "If I quit smoking, I will reduce my cardiovascular risk") are seen as being important in the motivation phase, when a person balances the pros and cons of certain behavioral outcomes. Further, one needs to believe in one's capability to perform the goal behavior (perceived self-efficacy, e.g., "I am capable of refraining from smoking in spite of the temptation to smoke"). Perceived self-efficacy operates in concert with positive outcome expectancies, both of which contribute substantially to forming an intention.

After a person develops an inclination toward adopting a particular health behavior, the "good intention" has to be transformed into detailed instructions on how to perform the desired action. Once an action has been initiated, it needs to be maintained. This is not achieved through a sin-

gle act of will, but involves self-regulatory skills and strategies. Thus, the postintentional phase should be further broken down into more proximal factors. In the following, two such volitional constructs, self-efficacy and planning, will be described in more detail.

Self-Efficacy Reflecting Different Challenges Within the Behavior Change Process

Perceived self-efficacy has been found to be important at all stages in the health behavior change process (Bandura, 1997), but it does not always constitute exactly the same construct. Its meaning depends on the particular situation of individuals who may be more or less advanced in the change process. Action self-efficacy, coping self-efficacy, and recovery self-efficacy have been distinguished by Marlatt, Baer, and Quigley (1995) in the domain of addictive behaviors. The rationale for several phase-specific self-efficacy beliefs is that during the course of health behavior change, different beliefs are required to master different tasks. For example, a person might be confident in his or her capability to make an attempt to quit a certain behavior (i.e., high action self-efficacy), but might not be very confident about resuming abstinence after a lapse (low recovery self-efficacy).

- *Preaction* self-efficacy (also called action self-efficacy or task self-efficacy) refers to the first phase of the process, in which an individual does not yet act, but develops a motivation to do so. Individuals high in preaction self-efficacy imagine success, anticipate potential outcomes of diverse strategies, and are more likely to initiate a new behavior. While preaction self-efficacy is instrumental in the motivation phase, the two following constructs are instrumental in the subsequent volition phase, and can, therefore, be summarized under the heading of volitional self-efficacy.
- *Maintenance* self-efficacy (also called coping self-efficacy) represents optimistic beliefs about one's capability to deal with barriers that arise during the maintenance period (the term coping self-efficacy has also been used in a different sense; therefore, we prefer the term maintenance self-efficacy). 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 in overcoming such hurdles. Once an action has been taken, individuals with high maintenance self-efficacy invest more effort and persist longer than those who are less self-efficacious.
- *Recovery* self-efficacy addresses the experience of failure, lapses, and setbacks. Self-efficacious individuals are optimistic to get back on track after being derailed. They trust their competence to regain control after a setback and to reduce harm (Marlatt, 2002).

There is a functional difference between these self-efficacy constructs, whereas their temporal sequence is less important. Different phase-specific self-efficacy beliefs may be harbored at the same point in time. The assumption is that they operate in a different manner. For example, recovery self-efficacy is most functional when it comes to resuming an interrupted chain of action, whereas action self-efficacy is most functional when facing a novel challenging demand (Luszczynska, Mazurkiewicz, Ziegelmann, & Schwarzer, 2007; Luszczynska & Sutton, 2006). This distinction between phase-specific self-efficacy beliefs has proven useful in various domains of behavior change. Preaction self-efficacy tends to predict intentions, whereas maintenance self-efficacy tends to predict behaviors. Individuals who had recovered from a setback needed different self-beliefs than those who had maintained theirs levels of activity (Scholz et al., 2005). Rodgers, Hall, Blanchard, McAuley, and Munroe (2002) have found evidence for phase-specific self-efficacy beliefs in the domain of exercise behavior (i.e., task self-efficacy, coping self-efficacy, and scheduling self-efficacy). In studies applying the HAPA, phase-specific self-efficacy differed in the effects on various preventive health behaviors such as breast self-examination (Luszczynska & Schwarzer, 2003), dietary behaviors (Schwarzer & Renner, 2000), and physical exercise (Scholz et al., 2005).

Action Planning Mediates Between Intentions and Behaviors

Good intentions are more likely to be translated into action when people develop success scenarios and preparatory strategies for approaching a difficult task. Mental simulation helps to identify cues to action. Research on action plans for health behaviors has been suggested by Lewin (1947), for example, in the context of food choice. He distinguished between an overall plan and a specific plan to make the first step toward a dietary goal. Leventhal, Singer, and Jones (1965) have argued that appeals based on fear 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 from the perspective of motivation and volition psychology (Gollwitzer, 1999). Meta-analyses have summarized the findings on the effects of implementation intentions on health behaviors (for an overview, see Gollwitzer & Sheeran, 2006). Action planning includes specific situation parameters ("when," "where") and a sequence of action ("how"). Planning is an alterable variable. It can be easily communicated to individuals with self-regulatory deficits. Randomized controlled trials have documented the evidence in favor of such planning interventions to improve the adoption and maintenance of health behaviors (e.g., Luszczynska, 2006; Luszczynska, Tryburcy, & Schwarzer,

2007). Therefore, the general emphasis of the present studies lies on the assumption that action plans constitute a valuable mediator that helps to bridge the intention-behavior gap.

Aims of the Present Studies

Much evidence underscores the theoretical contribution of the HAPA in the context of health behavior change (Schwarzer et al., 2007). The two present research examples represent new studies on health-compromising behaviors, namely cigarette smoking and poor dietary behaviors. So far, there has been no evidence that attests to the usefulness of the HAPA model in research on addictions such as smoking cessation. There is also a lack of studies on particular samples at risk, such as obese individuals. It is yet to be examined whether social-cognitive mechanisms of change can be generalized across a broader range of behaviors and samples that are distinct from the average population in terms of physical conditions, age, ethnic group membership, and other characteristics. The question is whether the model can be replicated in the context of an addictive behavior that has not, so far, been a subject of research and whether it appears to be applicable to individuals with a chronic condition.

Study 1: Predicting Less Smoking Among Young Adults

We hypothesized that among young adults, HAPA variables would predict smoking reduction. This is the first study that examined this pattern of variables as a prediction model for smoking behaviors.

Participants and Procedure

Of 832 students who took part in the first measurement, 700 also took part in the Time 2 measurement, whereas 530 participated in all measurement points. Among Time 1 participants, 281 students had been smoking at least 1 cigarette per day. Among those who participated in all measurement points, 166 participants declared that they had smoked at least one cigarette a day at Time 1. Data from this final sample of 166 students were employed in subsequent analyses.

Students reported smoking an average of more than 11 cigarettes daily; 40% smoked less than 10 cigarettes per day, and 7% smoked more than 20 cigarettes per day. The participants included in the analysis were 18 to 21 years old, with a mean age of 18.56 (SD = 0.87); 58.8% were men. Overall, they declared strong intentions to reduce the number of cigarettes smoked per day.

The research team visited 10 high schools in Poland during class hours and invited students to take part in a study after class. The study was presented as an investigation of participants' beliefs concerning smoking and involved a brief questionnaire (Time 1). Students completed a second questionnaire 1 month later (Time 2), and a third questionnaire 6 months after Time 2. Personal codes were used to ensure confidentiality.

Smokers who dropped out after Time 1 did not differ in their intention to reduce smoking from those smokers who took part in all waves of data collection, $F(1, 280) = 1.75$, *ns*. They also did not differ in terms of other social-cognitive constructs, all $F < 1$; age, $F(1, 280) = 1.34$, *ns*; and gender $\chi^2(1, 279) = 1.15$, *ns*.

Risk perception, positive outcome expectancies, preaction self-efficacy, and intention were measured at Time 1, maintenance self-efficacy, planning, and recovery self-efficacy were measured at Time 2, and smoking behavior was measured with open-ended questions at Time 3. Table 1 displays the item examples for all measures used in the study, means, standard deviations, reliability coefficients, and factor loadings obtained in structural equation analyses. Intercorrelations of variables are presented in Table 2.

Data Analysis

Structural equation modeling with latent variables and with maximum likelihood estimation was employed (see Arbuckle, 2003) to examine the longitudinal associations between HAPA variables. In the hypothesized model, perceived risk, outcome expectancies, and preaction self-efficacy were specified as predictors of intention. Intention and maintenance self-efficacy were specified as predictors of planning. Recovery self-efficacy and planning were specified as predictors of behavior. Evaluation of model-data fit was based on the following indices: Tucker-Lewis Index (TLI), comparative fit index (CFI), root mean square error of approximation (RMSEA), and χ^2 divided by degrees of freedom (χ^2/df). The following values indicate a good fit of the model to the data: TLI and CFI ranging from .90 to 1, RMSEA and SRMR below .08, and χ^2/df between 1 and 2 (Hu & Bentler, 1995; Marsh, Hau, & Wen, 2004). Missing data were considered by the full information maximum likelihood procedure.

Results

The hypothesized model fit the data well with $\chi^2 = 245.22$, $df = 143$, $p < .01$, $\chi^2/df = 1.72$, NFI = .95, RLI = .97, CFI = .98, RMSEA = .05 (95% CI: .03–.08). Figure 1 displays the parameter estimates (standardized solution). Planning was predicted by intention and maintenance self-efficacy measured 1 month earlier, accounting for 9% of variance in the use of planning strategies, as

Table 1. Constructs employed for both studies: item example, descriptive and reliability statistics

Construct	Sample	Item example	No. items	Response scale	α/*r*	*M*	*SD*	Factor loadings
Risk perception	1	Compared to people your age and gender, how would you estimate the likelihood that you will develop chronic disease of respiratory system?	3	–3 (much below average) – +3 (much above average)	.88	0.37	1.51	.71–.91
	2	Compared to people your age and gender, how would you estimate the likelihood that you will develop further cardiovascular problems (i.e., stroke or heart attack)?	2	–3 (much below average) – +3 (much above average)	.77	–0.11	1.73	.76–.92
Outcome expectancies	1	If I would reduce smoking, my fitness would be better	4	1 – 7	.70	4.44	1.78	.40–.74
	2	If I would change my diet into a healthier my family would be satisfied	3	1 – 4	.91	3.57	0.78	.82–.95
Intention	1	During next month I intend to reduce the number of cigarettes smoked daily	1	1 – 7		5.96	1.65	
	2	During next month I intend to reduce fat consumption (in particular animal fats).	1	1 – 4		3.35	0.86	
Preaction self-efficacy	1	I am confident that I am able to reduce smoking even if I would have to put many efforts to overcome my current habits	3	1 – 7	.78	4.54	1.70	.66–.94
	2	I am confident that I am able to change my diet into a healthier one even if I would have to form a plans about my nutrition	4	1 – 4	.92	3.02	1.03	.77–.92
Maintenance self-efficacy	1	I am confident that I am able to refrain from smoking (or smoke less) even if I would be partying or in a club	3	1 – 7	.80	4.39		.72–.93
	2	I am confident that I am able to maintain healthy diet even if I would be with my friends who do not stick to such a diet	3	1 – 4	.87	3.02	0.98	.75–.90
Planning	1	I have my own plan regarding how to reduce my smoking.	2	1 – 7	.47	3.74	2.04	.48–.59
	2	I have my own plan regarding where to buy my healthy food	3	1 – 4	.76	2.80	1.03	.66–.77
Recovery self-efficacy	1	I am confident that I can return to reduced smoking (or resume nonsmoking status) even if I smoked a lot for several days.	3	1 – 7	.76	4.02	2.08	.74–.94
	2	I am confident that I can resume healthy diet even if I would not stick to a healthy diet over a holiday period	3	1 – 4	.83	2.74	1.06	.75–.90
Health behavior: Smoking	1 (Time 1)	During last week, have you smoked at least one cigarette per day	1	0 (no) – 1 (yes)		1	0	
Health behavior: Smoking	1 (Time 3)	Think about last week. How many cigarettes have you smoked on average during last 7 days?	1	0.5 – 60 cigarettes daily		11.91	9.62	
Health behavior: Low-fat diet	2	Within last 2 weeks how often have you eaten fatty snacks (such as cookies, chips, chocolates)?	2	1 (once or twice) – 7 (4 times per day or more often)	.40	2.43	1.92	.48–.79

Note. Samples: 1 – smoking students; 2 – obese or overweight patients with chronic disease. The response scale 1–7 means: *definitely not* (1) to *exactly true* (7). The response scale 1–4 means: *definitely not* (1) to *definitely yes* (7).

Table 2. Correlations between the variables in Studies 1 and 2

Variable			2	3	4	5	6	7	8
1	Risk perception								
		Study 1	.04	.10	.03	.23*	.01	.03	.06
		Study 2	–.02	–.12	.25*	–.05	.10	–.01	–.15
2	Outcome expectancies								
		Study 1		.38**	.38*	.31*	.30*	.14	–.09
		Study 2		.21*	.28***	.40***	.25*	.37***	–.05
3	Preaction self-efficacy								
		Study 1			.34**	.42**	.45**	.12	–.25*
		Study 2			.38***	.25*	.12	.17	–.28**
4	Intention								
		Study 1				.32*	.19	.11	–.28*
		Study 2				.40***	.62***	.37***	–.06
5	Maintenance self-efficacy								
		Study 1					.21*	.53***	–.35***
		Study 2					.53***	.39***	–.59***
6	Planning								
		Study 1						.04	–.23*
		Study 2						.47***	–.24**
7	Recovery self-efficacy								
		Study 1							–.20*
		Study 2							–.60**
8	Behavior								
		Study 1							
		Study 2							

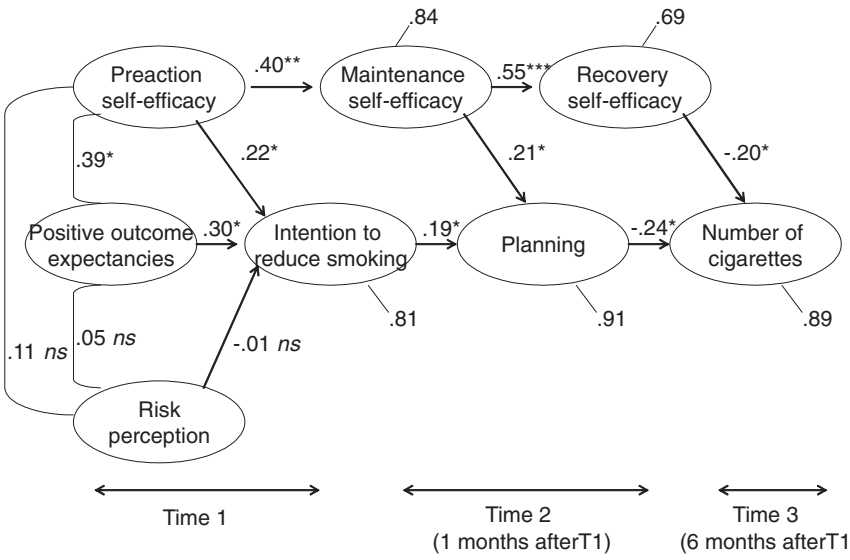

Figure 1. Prediction model for adolescent smokers in Study 1. *Note:* $p < .10$, $^{*}p < .05$, $^{**}p < .01$.

indicated by the residual path coefficient in Figure 1. Lower levels of smoking at Time 3 were predicted by stronger recovery self-efficacy and planning measured 6 months earlier. Those variables accounted for 11% of behavior. The relations between the three types of self-efficacy were moderate. Overall, 16% of variance of maintenance self-efficacy was explained by preaction self-efficacy, and 31% of variance of recovery self-efficacy was explained by maintenance self-efficacy (measured at the same time). Of all relations included in the model, only the path from risk perception to intention was not significant.

Study 2: Predicting Dietary Behaviors Among Middle-Aged Adults With Chronic Health Problems

We hypothesized that among overweight or obese patients with chronic disease, HAPA variables would predict adherence to a low-fat diet. To our knowledge, this is the first study that examined the predictive power of HAPA variables in such an at-risk sample.

Participants and Procedure

The research team visited four hospital wards (internal medicine) and three health care centers (specializing in diabetes care and treatment of cardiovascular diseases) in Poland. The study was presented to the potential respondents as an investigation of their beliefs concerning lifestyle changes that lead to better health and weight reduction (Time 1). Participants completed the Time 2 questionnaire approximately 2 months later. At Time 2, patients were invited to make an appointment with the experimenter during their regular check-up. If no check-up was scheduled (n = 36), the questionnaires were mailed and patients were telephoned 1 week later to respond to the questions.

Among 171 patients approached at Time 1, 74% had a body mass index (BMI) of 25 or above and were included in subsequent analyses. The experimenters were unable to establish contact with 10 patients at Time 2. The remaining sample of 116 overweight or obese patients was included in further analyses. Of the remaining participants, 31% had class I obesity, 6% had class II obesity, and 3% had class III obesity while 60% were overweight (BMI < 30). Average age was 54.57 years (SD = 10.01), ranging from 31 to 79 years, and 60.3% were men. The most frequently reported health problems were diabetes (46%) and cardiovascular diseases (67% of patients) such as hypertension, stroke, or myocardial infarction within 1 year before measurement. Additionally, 43% of patients had hyperlipidemia (high levels of cholesterol, cholesterol esters, estersphospholipids, or triglycerides).

Participants had rather strong intentions to stick to a diet low in fatty acids (in particular, low in saturated fat). At Time 2, participants declared consuming fatty foods almost every day (M = 2.43, SD = 1.92). Among patients with excessive body weight, those who did not participate in the second assessment, and patients who completed both measurements, differed neither in intention $F(1, 113) = 0.54$, ns; outcome expectancies, $F(1, 113) = 3.42$, ns; preaction self-efficacy, $F(1, 110) = 0.26$, ns; risk perception, $F(1, 111) = 0.09$, ns; nor gender $\chi^2(1, 116) = 3.41$, ns. The dropouts were slightly older, $F(1, 114) = 4.15$, $p = .05$.

Risk perception, positive outcome expectancies, preaction self-efficacy, and intention were measured at Time 1; maintenance self-efficacy, planning, recovery self-efficacy, and high-fat diet were measured 2 months later, at Time 2. In the questionnaire, a healthy diet was defined as reduction of fatty foods such as red meat, butter, mayonnaise and fat dressings, deep-fried food, and fatty snacks (including sweets and cakes prepared with animal fat). Table 1 displays the item examples for all measures used in the study, means, standard deviations, reliability coefficients, and factor loadings obtained in structural equation analyses. Intercorrelations of variables are presented in Table 2. Data were analyzed by means of structural equation modeling with latent variables (see Data Analysis section of Study 1).

Results

The hypothesized model fit the data satisfactorily, with $\chi^2 = 298.8$, $df = 160$, $p < .01$, $\chi^2/df = 1.87$, NFI = .94, TLI = .96, CFI = .97, RMSEA = .09 (95% CI: .07–.10). Figure 2 displays the parameter estimates (standardized solution). Planning was predicted by intention and maintenance self-efficacy as measured 2 months earlier, accounting for 53% of the variance in using planning strategies. Lower levels of high-fat food consumption at Time 2 were predicted by stronger recovery self-efficacy and planning, measured at the same point in time. Those variables explained 46% of the variance in high-fat consumption as indicated by the residual path coefficient in Figure 2. The interrelations between the three types of self-efficacy were moderate. Overall, 20% of the variance of maintenance self-efficacy was explained by preaction self-efficacy, and 17% of the variance of recovery self-efficacy was accounted for by maintenance self-efficacy (measured at the same time). All relations included in the hypothesized model were significant at $p < .05$, except the path from preaction self-efficacy to intention, $p < .10$. High risk perception predicted a stronger intention to adhere to a low-fat diet.

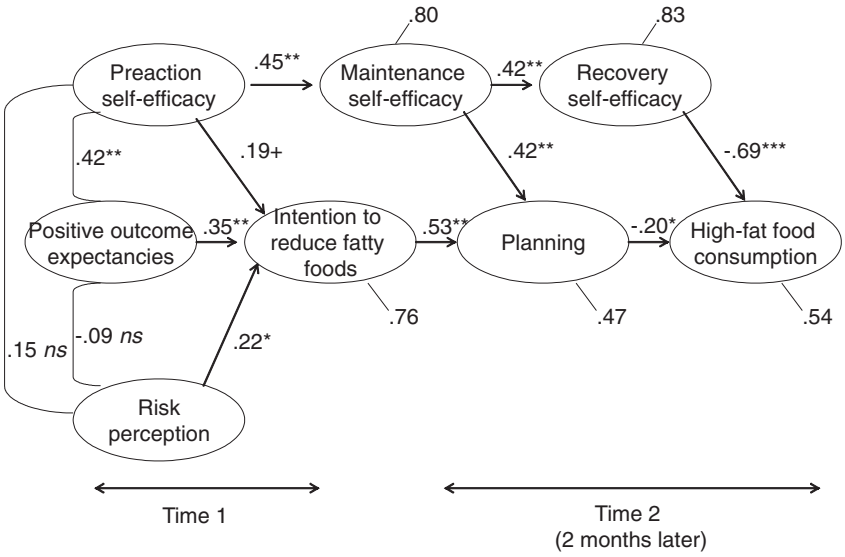

Figure 2. Prediction model for overweight or obese patients in Study 2. *Note:* $p < .10$, $*p < .05$, $**p < .01$.

General Discussion

Overall, the present findings are in line with the assumptions, and they corroborate the evidence that has emerged so far in other studies (Schwarzer et al., 2007). However, some of the results appear to be unique and require discussion, for example, the particular role of health risk awareness and the potential moderating role of age. In most of the previous studies, risk perception made only a very minor contribution within the intention formation process. In the present study, risk perception emerged as a predictor of the intention to reduce fat consumption in patients with chronic diseases and excessive body weight. In contrast, in the sample of young adult smokers, risk perception was unrelated to the intention to reduce smoking. Risk perception might be a negligible factor in individuals who do not belong explicitly to a high risk group. Because of the high prevalence of smokers and the long time lag between adolescent smoking and the experience of lung cancer in late adulthood, this factor might not operate in intention formation. Rather, the present findings suggest that positive outcome expectancies of nonsmoking and the belief in one's capability to quit might be stronger determinants for the motivation to reduce the number of cigarettes smoked. The overall amount of behavioral variance accounted for by the chosen predictors differs substantially between the young smokers sample and the older obese sample. Lifestyle changes done in favor of health improvement or risk avoidance might be personally significant for older individuals at risk as opposed to younger individuals who regard health-compromising behaviors as a prevalent way of life, not as a personal risk. To further elucidate this issue, a life span research approach needs to be taken. In a comparison of older and younger South Koreans in terms of their physical activity, we have found that the model fits better to the sample of older individuals (Renner, Spivak, Kwon, & Schwarzer, 2007). Other studies have applied the HAPA to older patients in cardiac rehabilitation (Scholz, Sniehotta, Burkert, & Schwarzer, 2007) and to older patients in orthopedic rehabilitation (Ziegelmann, Lippke, & Schwarzer, 2006). In these clinical studies, the model turned out to be very appropriate. This might be the result of the characteristics of individuals who were middle-aged or old and had experienced a major health crisis. In the context of major life events the motivation to change is supposed to be high. This means that these patients are expected to be in a post-intentional stage. In this stage, action planning and recovery self-efficacy are supposed to be of critical importance for goal pursuit and, thus, act as suitable proximal predictors of health behaviors, as in the present sample of overweight individuals with a health condition.

The two empirical examples presented here extend the knowledge base that is currently available about the usefulness of the HAPA. In previous overview articles we have presented seven studies (Schwarzer, 2008) and five studies (Schwarzer et al., 2007). The selected health behaviors were physical exercise, breast self-examination, seat-belt use, dietary behaviors, and dental flossing. It has been shown that the model is in line with data from various cultures and diverse samples, such as old and young men and women, students, and rehabilitation patients. In all cases, evidence suggested that the approach was successful without giving up the principle of parsimony. The main addition of the HAPA in comparison to previous models lies in the inclusion of two volitional factors: planning and volitional self-efficacy (either maintenance or recovery self-efficacy). The purpose of these additions was to overcome the black-box nature of the intention-behavior relationship. Identifying such volitional mediators helps to elucidate the mechanisms that come into play after people have formed an intention to change their health-compromising behaviors. By dividing the health behavior change process into a motivational and a volitional phase, the gap between continuum models and stage models is bridged. The HAPA constitutes a hybrid model in the sense that one

can apply it either as a continuum or a stage model. As a continuum model, it includes two mediators between intention and behavior. Because having formed an intention reflects a different mindset than having not done so, we regard the HAPA also as a stage model. The term stage is not meant in a biological sense. We use it synonymously with the terms phase or mindset. People can cycle and recycle in this process.

In two other studies we have added the construct of action control to the model (Schüz, Sniehotta, & Schwarzer, 2007; Sniehotta, Nagy, Scholz, & Schwarzer, 2006). While planning is a prospective strategy, that is, behavioral plans are made before the situation is encountered, action control is a concurrent self-regulatory strategy, where the ongoing behavior is continuously evaluated with regard to a behavioral standard. A study on dental flossing (Schüz et al., 2007) has investigated stage-specific effects of an action control treatment (a dental flossing calendar). The intervention led to higher action control levels at follow-up, thus, indicating volitional effects. However, the action control intervention did not improve intention formation, and, thus, had no motivational effect. Action control facilitated flossing behavior in volitional individuals only. In other words, a beneficial effect emerged only in the stage-matched condition. This result is in line with the HAPA, as it suggests that only intenders and actors benefit from self-regulatory efforts. A very parsimonious intervention, such as the provision of dental calendars for self-monitoring, may bring forth notable effects if correctly addressed to individuals who are in the volitional stage.

From the perspective of modeling health behavior change, the question arises as to how many and which volitional factors should be included to bridge the intention-behavior gap. After the inclusion of planning and volitional self-efficacy, action control would be a third promising candidate for a model that serves this purpose. One could also consider that there are conflicting motives that operate at the same time as the intention to change one's health behavior. Within the individual motive hierarchy, a particular intention might not receive a sufficient amount of attention because another intention has gained temporary priority. Future research needs to examine to what degree an accumulation of further volitional factors would account for substantial variance of health behaviors or whether this would violate the postulate of parsimony.

Some limitations need to be addressed. The present analyses are based on longitudinal data, but we do not analyze behavioral change, that is, the difference between baseline and subsequent behaviors. In all domains of human functioning, baseline behaviors are typically the best predictors of later behaviors, implying that their inclusion in the analyses could mask the unique 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. When analyzing longitudinal nonintervention data, the inclusion of baseline behaviors would be overly conservative because of underestimating the influence of social-cognitive variables that are also responsible for baseline behavior.

A general problem when trying to assess behavioral outcomes lies in the self-report measures that are often the only ones available. Moreover, the assessment often relies on single items ("How many cigarettes did you smoke?") because more complex measures are either not feasible or not superior in terms of psychometric properties. Single-item measures may be less reliable than multiitem scales. In structural equation modeling, by specifying latent variables with only one single manifest item, one assumes perfect measurement, which does not reflect reality. Thus, results can be compromised as a result of measurement limitations.

Although the present findings have added to the evidence base that attests to the universality and applicability of the HAPA, they do not necessarily prove that the chosen model is the only one that fits. The question is whether this model appears to be superior to alternative models. Finding the best model for a particular research context requires consideration of several questions: Which model accounts for most of the criterion variance? Which one provides the best insight into the causal mechanism of health behavior change? Is the model that makes the best prediction also the best one for the design of interventions? Which is the most parsimonious? To test the validity of a model in comparison with other theories of health behavior change, experimental studies are required.

A further question is whether we should judge the quality and usefulness of a model only in terms of explained behavioral variance. Gaining insight into mediating processes upgrades the importance of such mediators as secondary outcomes. The mediators are relevant criteria by themselves. Even if we cannot immediately change a certain refractory behavior, we might move a crucial step further by changing one of the proximal mediators into the right direction. Thus, elucidating the mechanisms of change is not only of pure scientific interest, but also has implications for health promotion.

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