On the Assessment and Analysis of Variables in the Health Action Process Approach: Conducting an Investigation

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Introduction

The Health Action Process Approach (HAPA) is a social-cognition model of health behavior suggesting that health behavior change is a process that consists of a *motivational phase* and a *volitional phase*.

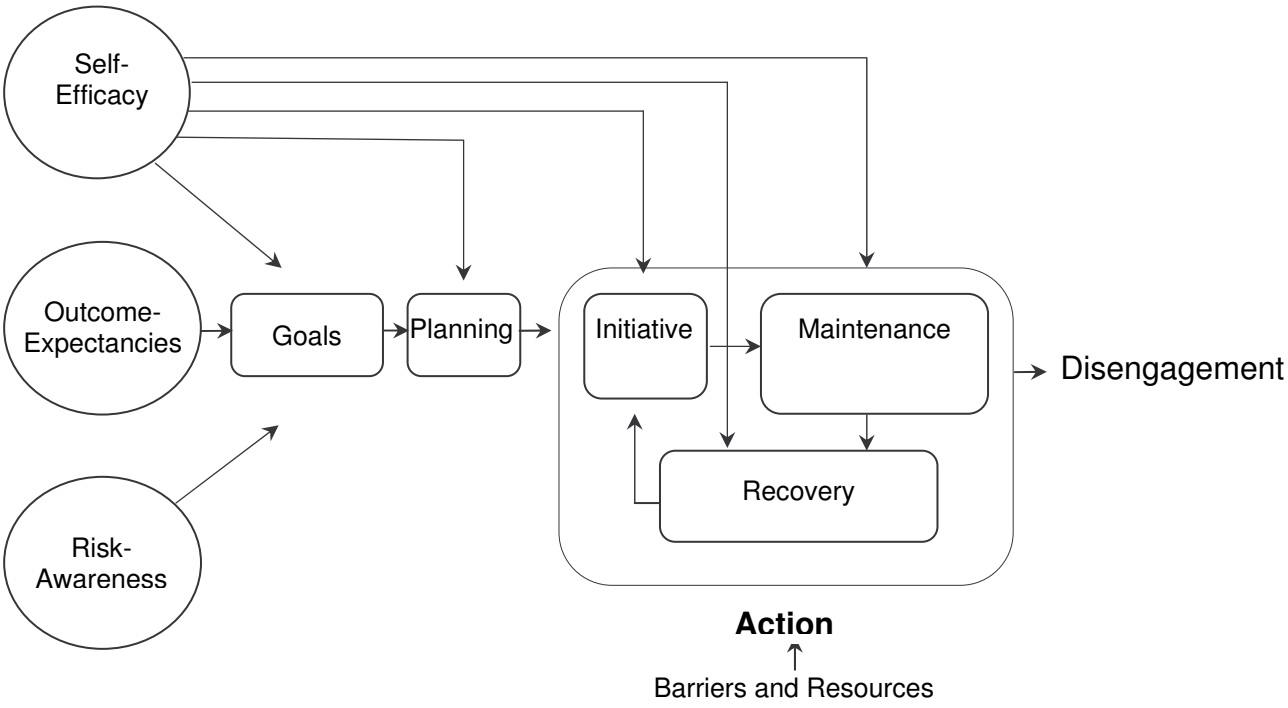

Figure 1: The Health Action Process Approach (HAPA).

The motivational phase is the process in which an individual forms an intention to either adopt a precautionary action or change risk behaviors in favor of others. The subsequent volitional phase covers the processes of implementing intentions into actual behaviors, that is, initiation, maintenance, and recovery. The following section, based on publications by Ralf

Schwarzer (1992, 1999, 2001), gives a brief overview of the basic theoretical constructs and assumptions of the HAPA model.

The Motivational Phase

The motivational phase in the HAPA is characterized by growing risk awareness, outcome expectancies, and perceived task self-efficacy that lead to the formulation of an intention (see the left-hand part of Figure 1). Although these self-beliefs are usually treated as unrelated predictors, there might be a temporal and causal order among them. A minimum level of threat or concern must exist before people start contemplating the benefits of possible actions and ruminate about their competence to actually perform them. The direct path from threat to intention may become negligible if expectancies are already well established. In the motivational process, an individual's beliefs about the contingencies of alternative health behaviors with various subsequent outcomes will influence the goal setting. Different positive and negative outcome expectancies are deliberated and balanced. The more perceived beneficial outcomes inherent in an alternative behavior, the more inclined a person might be to engage in a behavior change. However, outcome expectancies can be seen as precursors of self-efficacy because people usually make assumptions about the possible consequences of a behavior before contemplating whether they can really take the action themselves. A person who does not believe in her or his own capability to perform a desired action will fail to adopt, initiate, and maintain it. Self-efficacy is therefore seen as the most influential motivational factor and the strongest predictor of behavioral intentions.

The motivational phase is closed by forming an explicit goal or *behavioral intention*. Intentions comprise a person's motivation towards a goal or target behavior in terms of direction and intensity. Without explicit intentions, changes of habitual behavior patterns are unlikely to occur. Accordingly, behavioral intentions are among the best predictors for subsequent behavior. Nevertheless, good intentions do not necessarily guarantee

corresponding actions. Many attempts to give up unhealthy habits and to transform one's lifestyle into a healthier one fail despite good intentions.

The Volitional Phase

Once an intention to change a health behavior is formed, the change must be planned, initiated, and maintained, and relapses have to be managed (see the right-hand part of Figure 1). In these processes, self-regulatory processes play a critical role. After an intention to change or adopt a particular health behavior has been shaped, the intention has to be transformed into detailed *action plans* of when, where, and how to perform the desired action. A global intention can be specified by a set of subordinate action plans that contain proximal goals and algorithms of action sequences. Thereby, environmental cues can be used as elicitors of desired action and be exploited for the purpose of one's intentions. The number and quality of action plans is strongly influenced by self-efficacy because self-efficacious persons have experienced mastery through earlier planning, and they visualize successful scenarios that may guide goal attainment.

When the new action has been initiated, self-regulatory cognitions to control and maintain the behavior must be activated, and the action needs to be protected from old habits, situational barriers, or distracting secondary action tendencies. Moreover, new routines must be developed that can be turned into new, healthy habits in a later stage. Effort and persistence are strongly dependent on self-efficacy. The scope of self-efficacy beliefs in the volitional phase might differ from task self-efficacy in the motivational phase. To consolidate a newly adopted behavior might be more complicated than expected. Different concrete barriers appear in the course of action. Individuals with an optimistic sense of volitional self-efficacy visualize success scenarios in awkward situations that guide the action and let them persevere in the face of obstacles. Despite all good intentions and self-regulatory efforts, changes of habitual health behaviors seldom proceed without setbacks. Persons with

appropriate self-regulatory skills and confidence in their ability to cope with setbacks will quickly recover when running into unforeseen difficulties. Otherwise, disengagement might follow, and recovery or new initiatives need to be started.

HAPA can be applied to all *health-enhancing and preventive behaviors, risky lifestyles, and addictive behaviors* as well. Examples for research on the HAPA applied to risk behaviors are problem drinking (Murgraff & McDermott, 2003), eating salty and high-fat food (Satow & Schwarzer, 1998). Therapy compliance (Kühn, Mohs, & Schneider, 2001), preventive nutrition (Schwarzer & Renner, 2000; Schwarzer & Fuchs, 1996), low-fat food (Renner, Knoll, & Schwarzer, 2000), and performing regular breast self-examination (Garcia & Mann, 2003; Luszczynska & Schwarzer, 2003) are examples of applications in domains of health-enhancing and preventive behaviors.

Here it is intended to provide some established techniques for the psychometric assessment and analysis of the key variables of HAPA. These techniques have provided measures high in reliability and validity in a number of applications of the HAPA as well as in related research. Examples for item construction are given. Each construct should be assessed by an appropriate number of items to assure reliability. Moreover, a brief overview of appropriate research designs and methods to test HAPA assumptions is provided. Finally, scale resources that are available online and previously published applications of the HAPA are listed in the Appendices.

Assessement

Behavior in the HAPA

Health behavior assessment covers a wide range of different actions that can be conceptualized as relevant in terms of different health conditions (see Renner, 2001, for an overview). The method used most commonly in health psychology to measure behaviors are self-reports, assessing past behavior (e.g., interviews, questionnaires, diary logs), but in many

cases direct or indirect observation or physiological measures are recommended. Because retrospective assessment strategies often cause biases and distortions, some techniques have been developed to reduce errors in assessment procedures (cf. Stone & Shiffmann, 2002).

The goal behavior consists either of an action performed on a *single occasion* or of *repeatedly performed behavior(s).* For example, in the prediction of a particular preventive checkup, it is asked whether a person has actually participated in that one checkup. Other health behaviors, such as physical exercise, have to be performed continually in order to be health-relevant. The *length of a defined time span*, for example one month, or the *average or typical quantity and frequency* can be asked.

The *level of aggregation* of the behavior can be very broad (for example, nutrition behavior "to follow a low-fat diet") or more precisely defined (e.g., "to partake of low-fat milk and milk products with 1.5% fat at the most"). To measure precisely either the daily consumption (e.g., in nutrition) or the frequency and duration (e.g., in exercise behavior) questions are asked, such as, "How many days per week did you perform sports activities, and for how many hours and minutes per session was that?" Alternatively, the answers can be given on rating scales with verbal anchors, such as, *less than once a month or never* (1), *1-3 times a month* (2), *once a week* (3), *3-4 times a week* (4), and *(almost) every day* (5). If there is a broad question to rate a statement (e.g., "I follow a low-fat diet"), the answers can be given on a rating scale ranging for example from *not at all* (1) to *exactly* (4). Standardized instruments are available for numerous behaviors, and they should be used if they fit the scope of the study.

Process Measures of Health Behavior Change

Initiating, maintaining, and recovery processes are best investigated by longitudinal studies. *Changes* are differences of the previous and subsequent behavior, in terms of controlling for the baseline (e.g., residualized change scores) or computing a difference score. *Initiation* is

conceptualized as a newly adopted behavior (e.g., a smoker stops smoking). *Maintenance* stands for a behavior that is continued (it was performed at the first measurement point and also at the follow-up measurement point[s]; for example, a man wasn't drinking alcohol in November and still wasn't in December). *Recovery* is the process where a setback is managed and a behavior that was given up for a short time is performed again; for example, a woman drinks champagne on New Year's Eve and reverts to her nonalcoholic life-style on New Year's Day.

Risk Awareness

Risk awareness specifies quality and quantity of an individual's perceived susceptibility to a health threat. It is usually organized along the dimensions of vulnerability and severity. Vulnerability addresses the perceived probability of being affected by a health threat, such as developing hypertension. Vulnerability should be assessed both as an absolute (i.e., the subjective probability of being affected) and as a relative construct (i.e., the subjective probability of being affected compared to people of the same age and gender), as suggested by Weinstein (1987). To assess the subjective relevance of a health threat, an individualized severity rating might be employed.

The items measuring absolute vulnerability consist of a stem such as "How do you estimate the likelihood that you will ever suffer from (…)?" For relative vulnerability, the stem also includes a comparison group, such as "If I compare myself with an average person of my sex and age, then my risk of suffering from (…) is (...)." The answers are given on Likert scales, for example, ranging from (1) *very unlikely,* over (4) *moderately likely,* to (7) *very likely* for absolute vulnerability, and from (1) *very low,* over (4) *average,* to (7) *very high* for relative vulnerability.

Severity is measured with items such as "How severe would the following health-related problems be if they weren't attended to, or if they remained undiscovered?" The

illnesses then have to be rated on a Likert scale, for example, ranging from (1) *not at all severe (can be ignored),* over (4) *moderately severe (as if someone has the flu*), to (7) *very severe (life threatening)*. The anchors at (1), (4) and (7) might be varied according to different threats under study. Individual severity ratings are assessed with an item stem such as "What do you think, how threatening is (…) for your health?" The answers are given on Likert scales constructed analogously to the severity ratings. A score for absolute vulnerability, relative vulnerability, and severity is computed by adding up the answers for all items of the scale.

The same health threats should be used for vulnerability and severity measurements in the same order. It might also be useful to assess a variety of health threats that might be related to the behavior in question. As an example, a sedentary lifestyle can be associated with increased cardiac risk and higher vulnerability to colon cancer as well.

Outcome Expectancies

Outcome expectancies are subjective beliefs about contingencies of an individual's behavior with subsequent outcomes. These outcomes are evaluated with regard to their favorableness for the individual as positive or negative. The more positive and/or the fewer negative consequences a person expects by changing the behavior, the more likely the person will form an intention in favor of the target behavior. Positive and negative outcome expectancies are two different dimensions, although they are not necessarily independent of each other.

Outcome expectancies are assessed by formulating items consisting of if/then statements. They are generated by specifying a common stem that includes the behavior under study. The if-condition specifies the target behavior ("If I start exercising regularly,…"), whereas the then-condition consists of a possible positive or negative consequence of the behavior. An example for a negative consequence would be "...then I need to invest a lot of effort to organize it." Positive outcome expectancies would be "If I start exercising regularly, I will be

less vulnerable for diseases." The answers are given on a four-point Likert scale ranging from (1) *not at all true* to (4) *exactly true*.

The score for the pros and cons are computed by adding or averaging the answers over all items of the positive and negative outcome expectancies scales, respectively.

Task Self-Efficacy

Task self-efficacy is the perceived capability of a person to implement a certain behavior. Task self-efficacy (also named as action self-efficacy; Schwarzer & Renner, 2000) facilitates goal-setting. The stem of a task self-efficacy item contains a statement about the target behavior or the behavior change. Following the principle of compatibility (Ajzen, 1996), the behavioral statement must correspond with the target behavior in regard to the specificity. The barriers of the task self-efficacy items are of more general nature compared to the stem and barriers included in the volitional self-efficacies (see next section). Thus, task self-efficacy items may consist of a stem like "I am confident that I am able to be physically active regularly…," which is followed by a barrier such as "…even if it is hard for me" or "…even if I don't like it initially." In the case of a very specific behavioral criterion in the item stem (e.g., "I am confident that I can go running regularly at least twice a week for 30 minutes") a general barrier may be added, such as, "…even if it turns out to be difficult." The answers are given on a four-point Likert scale ranging from (1) *not at all true* to (4) *exactly true*. The score for task self-efficacy of a person is computed by adding or averaging the answers over all items.

Behavioral Intentions

Behavioral intentions are explicit decisions to act in a certain way, and they comprise a person's motivation towards a goal in terms of direction and intensity (Sheeran, 2002). The assessment of intentions in the HAPA model is based mainly on dichotomous-graded items

such as “I intend to engage in vigorous physical activity at least twice a week.” Answers anchored by *strongly disagr*ee and *strongly agree* are given on four-point Likert scales or on finer scales, as ceiling or floor effects are likely to result in some domains (e.g., most post-rehabilitation patients are highly motivated to comply to the given recommendations). A score is computed by adding up all the items of the respective scale. In addition to the principle of *compatibility* (Ajzen, 1996), Courneya (1994) has made recommendations about *scale correspondence* between measures of intention and behavior, which is particularly important with regard to repeated behaviors.

For an overview of how well intentions predict behavior and a discussion of measurement artifacts, see Sheeran (2002). Finally, it is important not to confound behavioral intentions with *behavioral expectations,* which are an estimation of the likelihood that the individual will perform a specified behavior.

Volitional (Phase-Specific) Self-Efficacy

Volitional self-efficacy, together with intentions, is the crucial predictor of action planning and an important predictor of health behavior change. Volitional self-efficacy can be subdivided into coping (maintenance) self-efficacy and recovery self-efficacy.

Coping self-efficacy describes optimistic beliefs about one’s capability to deal with barriers that arise during the maintenance process. A new health behavior might turn out to be much more difficult to adhere to than expected, and a self-efficacious person responds confidently with better strategies, more effort, and prolonged persistence to overcome such hurdles.

Recovery self-efficacy pertains to one’s conviction to get back on track after being derailed. The person trusts his or her competence to regain control after a setback or failure. If a lapse occurs, individuals with low recovery self-efficacy can fall prey to the “abstinence violation effect” where they attribute their lapse to internal, stable and global causes,

dramatize the event, and interpret it as a full-blown relapse (cf. Marlatt, Baer, & Quigley, 1995). High self-efficacious individuals, however, avoid this effect by making a high-risk situation responsible and by finding ways to control the damage and to restore hope.

To simplify *item construction*, one can keep in mind that self-efficacy items are confidence statements. The semantic structure of self-efficacy items can be: "I am confident that I can ... (perform/maintain/readopt an action), even if ... (a barrier)." The barriers should refer to problems that might arise during the maintenance or recovery process. Regarding maintenance and recovery in the process of adopting breast self-examination, the following items can be used: (a) "I am able to maintain it regularly even if I need a long time to develop the necessary routines" (coping self-efficacy); (b) "I am able to return to regular breast self-examination even if I happen to give it up for three months" (recovery self-efficacy). The items might be scored from (1) *not at all true* to (4) *exactly true.*

Action Planning

Action planning specifies in detail how and under what situational circumstances an intended action is to be implemented. An action plan usually consists of concrete ideas about "when," "where," and "how" to act for the purpose of the goal intention. For some behavior under study, it can also be useful to comprise whether a person has planned "how often" and "with whom" to act or to include some behavior-specific features (e.g., acquire equipment for a certain sport) that could be an additional part of planning.

In the Health Action Process Approach, planning is construed as a continuous process. The depth of elaboration of planning cognitions can vary. Someone may have already made precise plans to exercise in a gym, but has not yet decided when to go. Therefore, all defining components of planning such as when, where, and how are assessed by different items. Combinations of different defining components within one item should be avoided. Nevertheless, planning scales usually yield a high homogeneity.

For some behaviors it is not useful to assess all components. Everyday behaviors such as a low-fat diet or attempts to avoid a risk behavior (e.g., smoking) cannot always be assigned to a certain location or point in time. The scales need to be modified for such behaviors. The "how" and "when (to start)" are the most crucial planning components for changing one's diet or for smoking cessation.

The planning items consist of a stem such as "I have had my own plan regarding…" or "I have already planned precisely…" followed by the defining components of the plan and the target behavior, for example, "…when I will exercise," "where…," "how…," how often…," "with whom…," and so forth. The answers are given on a four-point Likert scale ranging from (1) *not at all true* to (4) *exactly true*. A score for the planning measure is computed by adding the answers over all items.

Design

The health action process is modeled by the sequencing of the social-cognitive variables, intention, action planning, and the action itself. In all stages of questionnaire construction, it is important to consider the *Principle of Correspondence or Compatibility* (cf. Ajzen, 1996). This requires that all other constructs (self-efficacy, outcome-expectancies, risk-perception, intention, and planning) are defined in terms of exactly the same elements. To investigate the assumptions of the HAPA, at least two measurement points are recommended to test the model assumptions: Risk perception, outcome expectancies, preaction self-efficacy, and intention should be measured at Wave 1. Planning, coping self-efficacy, recovery self-efficacy, and behavior should be measured at Wave 2. However, it is suggested to measure all constructs at all measurement points in order to control for the baseline or to compute change scores. Typical longitudinal research consists of survey methods, pre-post studies, and experiments.

Analysis

Data Analysis Using SEM

Structural equation modeling (SEM; cf. Hoyle, 1995) should be used for determining whether the social-cognitive variables included in the HAPA model explain the behavior or behavior change. A hypothetical model consists of latent variables which represent the HAPA constructs.

One-Group Longitudinal Design

In order to determine whether the HAPA variables are related to the selected behaviors, structural equation modeling with appropriate estimation methods might be performed.

An alternative model representing the null hypothesis could be constructed for testing the effects of selected constructs on other variables within the HAPA (e.g., effects of planning on behavior). One of the competing models, such as A1, tests the null hypothesis that planning a behavior is unrelated to the social-cognitive variables (the path representing linear dependency between those variables is constrained to be zero). Comparisons between the hypothetical model and a competing model can be based upon the chi-square difference tests. Examples of testing the HAPA model by means of SEM with one group of participants, measured longitudinally, are described by Schwarzer and Renner (2000) and Luszczynska and Schwarzer (2003).

Design With Experimental and Control Groups

If the study aims at examining the effects of experimental manipulations (e.g., interventions used to increase coping and recovery self-efficacy), a two-group model, with control and intervention groups separated, should be calculated. In both intervention and control groups, the specifications are as described above. A two-group model can be analyzed according to a procedure proposed by Kenny (2000), which enables testing differences between groups in a

two-group model. It is recommended to test whether the hypothetical baseline model without any invariance in both groups is a reasonable model with good fit. If so, this model might be used as a baseline to test invariance of factor loadings, equality of paths, equality of error variances, and equality of factor variances in both groups.

The groups can be compared in terms of the strength of associations between the variables (that is, the relations between coping self-efficacy and behavior in control and intervention groups might be compared) and the percentage of explained variance (that is, whether the variance of behavior, explained by HAPA constructs, differs in intervention and control groups). An example of testing HAPA by means of a two-group model calculation based on longitudinal data is described by Luszczynska (in press).

Data Analysis Using Manifest Variables

There may be studies where an SEM analysis is not feasible due to lack of sample size, scale properties of outcome variables, or the number of items per indicator. In these cases, regression analyses or discriminant function analysis are recommended.

Regression Analyses

In order to investigate prediction patterns, regression analyses are computed. Here, intention, planning, and action are predicted with the appropriate HAPA variables, including a baseline control for behavior. Hierarchical regression might be conducted to study the incremental explanatory power of volitional variables over and above the effect of behavioral intentions (Schwarzer & Fuchs, 1996).

Interaction analysis can be conducted to investigate differences in linear prediction between persons in the motivational and the volitional phases. For example, volitional variables are assumed to show more predictive power in volitional rather than in motivational persons when behavior is predicted.

Discriminant Analysis

In order to examine how theoretically defined subgroups (e.g., intenders vs. non-intenders) differ in terms of social-cognitive variables, discriminant analyses can be computed.

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