From 'I Wish' to 'I Will': Social-cognitive Predictors of Behavioral Intentions

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Abstract

We tested the ability of several social-cognitive models to predict intentions to engage in two different health behaviors (resisting dieting and performing breast self-exam). All constructs from the health belief model (with and without self-efficacy), the theory of planned behavior (with and without perceived behavioral control) and the motivational process of the health action process approach were measured simultaneously in two subject samples. We hypothesized that models that include self-efficacy (or the related construct of perceived behavioral control) would be more effective than the models that do not include it. Our results supported this prediction. The health action process approach was the best predictor of intentions to engage in both behaviors. Implications for selecting appropriate models on which to base interventions are discussed.

Keywords

health brief model, theory of planned behaviour, health action process

UNDERSTANDING the predictors of health behavior change is an important step in developing interventions to promote health and prevent illness. While many models of health behavior change have been evaluated, there have been surprisingly few empirical studies comparing the models directly to each other (Weinstein, 1993). Without these comparisons, we do not know which models are most effective in predicting behavior change. In addition, because it is likely that different models will be ideally suited to explain different classes of behaviors, it would be helpful to learn which models are most useful for predicting change in particular health behaviors. For example, models that include social norms may be better able to predict behaviors that are conducted in front of one's peers than behaviors that are performed in private. Interventions aimed at health behavior change will be most effective if they target the psychological constructs that are most relevant for the health behavior of interest.

Health behavior change is often conceptualized as involving two separate processes: a motivational process and a volitional process (Heckhausen & Kuhl, 1985). In the motivational process, people are thought to move 'from wish to will' (Schwarzer, 1999, p. 117), forming an intention to change their behavior. In the volitional process, the change is planned, started and maintained. Different factors lead to success in each of the processes, so it is useful to examine them separately. Because social-cognitive models appear to focus most closely on the motivational process (although they do not necessarily make this focus explicit), the present study examines only motivational processes. We tested the effectiveness of social-cognitive models in predicting intentions to engage in two different health behaviors: resisting dieting and conducting breast self-exams.

The models

Research on health behavior change has examined a variety of models and behaviors. Two of the most frequently studied models of health behavior change are the health belief model (Becker & Maiman, 1975) and the theory of reasoned action (Fishbein & Ajzen, 1975). In addition, many researchers have added a self-efficacy (SE) component to extend the predictive ability of the health belief model and have added perceived behavioral control (a construct similar to self-efficacy) to the components of the theory of reasoned action to create the theory of planned behavior (Ajzen, 1985). A newer model that is gaining attention is the health action process approach (Schwarzer, 1992, 1999).

The health belief model (HBM; Becker & Maiman, 1975) was originally formulated to predict when people would participate in one-time preventive health measures, such as screening tests. The model has four components that are each predicted to explain when individuals will comply with a health recommendation. The first component, perceived susceptibility, refers to how vulnerable individuals feel toward health threats, and the second, perceived severity, refers to how serious or dangerous the individual perceives the health threat to be. The third component, perceived benefits, refers to individuals' beliefs about whether the recommended action will reduce the threat of the illness. Finally, perceived barriers refers to individuals' beliefs about whether they can overcome the negative consequences associated with the recommended action. The construct of self-efficacy is often added to the HBM when it is used to predict long-term adherence behaviors (e.g. smoking cessation), and it has been shown to increase the utility of the model in those cases (Rosenstock, 1990).

The theory of reasoned action (TRA; Ajzen & Fishbein, 1980; Fishbein & Ajzen, 1975) was originally devised to predict behavior in general, but it has often been used to predict health behaviors. According to the TRA, the intention to engage in a behavior is a direct precursor to engaging in the behavior. Intentions themselves are based on people's attitudes toward that behavior and on subjective norms regarding the behavior. The attitude component is comprised of beliefs that performing the behavior will have particular consequences (referred to as behavioral beliefs in this model, but usually called outcome expectancies) and the value individuals ascribe to those consequences. Subjective norms are based on an individual's judgment about whether or not others will approve of the behavior, combined with their motivation to comply with the views of those others.

The theory of planned behavior (TPB)

(Ajzen, 1985) extends the TRA to include perceived behavioral control, the extent to which individuals believe that a specific behavior would be easy to perform. Perceived behavioral control is a construct that most researchers find conceptually similar—even equivalent—to self-efficacy (e.g. Sheeran, Conner, & Norman, 2001), although there are some exceptions (e.g. Terry & O'Leary, 1995). Both constructs refer to individuals' appraisals of their ability to engage in a particular behavior. Self-efficacy, however, is usually measured in terms of individuals' confidence in their ability to perform the behavior, while perceived behavioral control is usually measured in terms of difficulty or ease of performing the behavior. Perceived behavioral control was added to the TPB to account for behaviors that are not under individuals' full volitional control, and it is thought to affect an individual's behavior both directly and through behavioral intentions. Three meta-analyses (Albarracin, Johnson, Fishbein, & Muellerleile, 2001; Hausenblas, Carron, & Mack, 1997; Sheeran & Taylor, 1999) found that perceived behavioral control explained a small but significant amount of the variance in two behaviors (condom use and exercise) that are not fully under an individual's volitional control (according to subject ratings in Madden, Ellen, & Ajzen, 1992).

The health action process approach (HAPA; Schwarzer, 1992, 1999, 2001) explicitly divides behavior change into two main processes. In the first process, an intention to change the behavior is formed, so only this first process pertains to the current discussion. According to the model, the intention is based on three factors. First, individuals must believe that there is a significant threat from the disease. This construct is a combination of perceived susceptibility and perceived severity from the HBM.[1] Second, individuals must believe that changing a particular behavior would reduce the health threat. This construct, outcome expectancy, is the same construct referred to as behavioral beliefs in the TRA and TPB. The third factor that affects intentions is self-efficacy. A distinction is made between action self-efficacy, which is believed to influence intentions, and coping self-efficacy, which is thought to operate in the second stage of behavior change (Schwarzer & Renner, 2000). Action self-efficacy focuses on setting goals, while coping self-efficacy refers to adjusting goals when confronted with setbacks.

Comparing the models

Although each model has been well studied on its own, there are very few articles that compare more than two of the models head to head, despite an often cited call to do so (Weinstein, 1993). In his article describing the need to empirically compare theories of health-protective behavior, Weinstein points out that through 1991, there were only four articles that compared two or more models to each other. An update of that search from 1992 through 2002 finds three more studies empirically comparing two models (Conner & Norman, 1994; Quine, Rutter, & Arnold, 2000; Vanlandingham, Suprasert, Grandjean, & Sittitrai, 1995). The studies compare either the TRA or the TPB to the HBM, and two find that the norm component of the TRA/TPB plays a strong role in predicting a social or public behavior (condom use and bike helmet use) (Quine et al., 2000; Vanlandingham et al., 1995). The third study finds the TPB and the HBM to be equally effective at predicting health screening intentions (Conner & Norman, 1994).

The research summarized above suggests that the addition of perceived behavioral control to the TRA or self-efficacy to the HBM will add to the predictive ability of the models, particularly when they are predicting a behavior that is not fully under volitional control (Madden et al., 1992). Consequently, we expect that the HBM with self-efficacy, the TPB and the HAPA (which all include self-efficacy or perceived behavioral control) will be better predictors of intentions than the HBM alone or the TRA, particularly in the case of resisting dieting, which is less under a person's volitional control than engaging in breast self-exam. However, the dearth of previous research that directly compares some of these models to each other makes it hard to make clear predictions. The purpose of the current studies is to help create a literature of empirical comparisons of these models, so that researchers can be guided in their selection of models on which to base interventions.

Study 1

In the first study, we examine the ability of the models to predict intentions to resist dieting. Dieting is prevalent in the United States, and has potential negative health consequences. According to the Centers for Disease Control and Prevention (1991) between 40 percent and 70 percent of women in the United States are dieting at any given time. Further, approximately 60 percent of the women who are trying to lose weight are not overweight (Levy & Heaton, 1993). For normal weight women, chronic dieting for the purpose of weight control poses potential physical and mental health risks and is likely to be unsuccessful (McFarlane, Polivy, & McCabe, 1999). In a study by French and colleagues (1994), women who were dieting at baseline or who had a history of dieting gained more weight after two years than those who did not have a history of dieting. Chronic dieters are also more likely to experience weight fluctuations than non-dieters, and these fluctuations are associated with an increased risk of all-cause mortality and mortality from cardiovascular disease (Lissner, Andres, Muller, & Shimokata, 1989). In addition, dieting appears to be related to the development of eating disorders (McFarlane et al., 1999).

Given the prevalence of dieting in normal weight women combined with the potential health risks associated with dieting, we examined the efficacy of the HBM (with and without self-efficacy), TRA, TPB and HAPA in predicting intentions to resist dieting. In addition to being a needed comparison of the models, this study will allow us to examine whether it is useful to conceptualize resisting dieting as a health behavior. Women in our culture are bombarded with messages to diet that do not distinguish between underweight, normal weight and overweight women. These messages may make underweight and normal weight women feel that they should diet, even though for these women, dieting poses few benefits and several health risks. Despite this fact, women may not think of resisting dieting as a healthy behavior. This study will help us understand whether conceptualizing resisting dieting as a health behavior is a potentially useful endeavor.

We expect that the three models that include self-efficacy or perceived behavioral control (the TPB, the HBM plus self-efficacy and the HAPA) will be more effective in predicting intentions to resist dieting than the other models, because resisting dieting is not entirely under an individual's volitional control (Ajzen, 1985). Most meals are eaten with other people, and frequently, the person eating did not cook or select the food. Further, even when cooking for oneself, it is often necessary to take others' preferences into account. An alternative hypothesis is that we might expect the models that include subjective norms (the TRA and the TPB) to predict dieting intentions better than the models that do not include norms, because dieting is thought to have a strong social component (Mori, Chaiken, & Pliner, 1987; Polivy, Herman, Younger, & Erskine, 1979).

Method

Participants

One hundred and fifty-nine female undergraduates in a social psychology course participated in a class discussion section. Male students participated as well, but their data will be reported elsewhere. All participants were treated according to American Psychological Association (APA) ethical guidelines (APA, 1992).

Procedure

When students arrived at their weekly discussion section, they were told about the study, presented with consent forms and were invited to participate. All students present in class agreed to participate. Students were reminded that their responses would be anonymous, and they were encouraged to answer each question as honestly as possible. They were instructed to leave items blank if they did not feel they could provide an honest response. After signing their consent forms, students were asked to complete the questionnaires.

Measures

All constructs contained in the five models were measured. To ensure that we measured constructs appropriately for each model, the HBM constructs were measured using the same techniques as Aiken, West, Woodward and Reno (1994), the TRA constructs were measured using the same techniques as Fisher, Fisher and Rye (1995) and the HAPA constructs

were measured using the same techniques as Schwarzer and Renner (2000).

Demographic variables Participants answered a series of demographic questions that included age, ethnicity, year in school, weight and height. Body Mass Index (BMI) was computed using the standard formula (weight in kilograms/height^2 in meters).

Behavioral beliefs Participants rated the likelihood of each of eight possible consequences of resisting dieting using a seven-point Likert scale from 0 (very unlikely) to 6 (very likely). Sample items included: 'If I resisted going on a diet, I would feel better about myself' and 'If I resisted going on a diet, I would enjoy social activities that involve food more'. This construct is referred to as outcome expectancy in the HAPA.

Outcome evaluations Participants rated how 'good' or 'bad' each of those outcomes would be using a seven-point Likert scale from 0 (very bad) to 6 (very good).

Attitude toward the behavior The behavioral belief for each outcome was multiplied by its corresponding outcome evaluation to create an indirect measure of the attitude toward each item, as used in the TRA and TPB. The scale is sufficiently reliable (α = .72) and higher numbers on this scale reflect more positive attitudes toward resisting dieting.

Normative beliefs Two items were used to measure normative beliefs: 'My friends think I should resist dieting' and 'My family thinks I should resist dieting'. Participants were asked to rate these items on seven-point Likert scales from 0 (strongly disagree) to 6 (strongly agree).

Motivation to comply Participants rated two statements regarding their motivation to comply with their friends and family: 'When it comes to dieting, I want to do what my friends think I should do' and 'When it comes to dieting, I want to do what my family thinks I should do'. These items were rated on the same scale that was used for the normative beliefs.

Subjective norms Each normative belief was multiplied by its corresponding motivation to comply, to obtain two indirect measure of subjective norms, as used in the TRA and TPB. The two items were significantly correlated (r = .57, $p < .001$), so they were combined to create one score representing the extent to which the individual felt pressured to follow the dieting norms of family and friends.

Perceived behavioral control The TPB construct, perceived behavioral control, was measured with two items (Sutton, McVey, & Glanz, 1999). Participants indicated the extent to which they agreed with each item on seven-point Likert scales from 0 (strongly disagree) to 6 (strongly agree). Responses to the two items, 'I have no control over whether I go on a diet', and 'It would be difficult for me to resist going on a diet', were significantly correlated (r = .42, $p < .001$), so they were combined into one measure of perceived behavioral control. The items were reverse coded so that higher numbers on the measure indicate more perceived control over dieting.

Susceptibility Participants were asked the extent to which they agreed with the following three items: 'There is a chance I will develop an eating disorder', 'I am likely to get an eating disorder' and 'People like me get eating disorders'. They rated these items on seven-point Likert scales from 0 (strongly disagree) to 6 (strongly agree). The items were combined into a scale in which higher scores indicate more perceived susceptibility to eating disorders, and is used in both the HBM and the HAPA. The scale has sufficient reliability (α = .81).

Severity Using the same scale as the susceptibility items, two items were used to measure the HBM and HAPA construct, perceived severity of eating disorders. The items are 'Eating disorders disrupt your life' and 'Eating disorders are dangerous disorders'. The items were significantly correlated (r = .58, $p < .001$) and were combined into one score in which higher numbers indicate greater perceived severity of eating disorders.

Benefits Five benefits of resisting dieting (an HBM construct) were listed and participants were asked to rate the extent to which they

agreed with those benefits on the same scale as the other HBM items. Sample items include, 'Resisting dieting lowers my risk of eating disorders' and 'Resisting dieting lowers my risk of binge eating'. The items were combined into a scale in which higher numbers indicate greater perceived benefits of resisting dieting, and the scale had satisfactory reliability (α = .80).

Barriers Participants rated the extent to which they agreed with seven barriers to resisting dieting on the same seven-point Likert scales as were used for the other HBM components. Sample items include: 'I would resist dieting, but I am overweight' and 'I would resist dieting, but I want to prevent heart disease'. The items were combined into a scale in which higher numbers indicate greater perceived barriers to resisting dieting, and the scale had satisfactory reliability (α = .71).

Self-efficacy Participants rated a series of eight questions concerning how confident they felt they could resist dieting using an 11-point Likert scale from 0 (not at all confident) to 10 (extremely confident). Sample items include: 'I can resist dieting even if others around me are dieting', and 'I can resist dieting even if I feel fat'. The items were combined to create a scale in which higher numbers indicate greater confidence in resisting dieting, and the scale had satisfactory reliability (α = .95). All self-efficacy items can be considered to measure action self-efficacy, as conceptualized in the HAPA.

Intentions Participants were asked to respond to 11 questions concerning their intentions to avoid dieting and to diet. Four items phrased in terms of dieting were reverse coded, and a scale was created in which higher scores meant greater intentions to resist dieting. Sample items included 'On how many days out of the next 28 days do you intend to consciously try to restrict the amount of food you eat to influence your shape or weight?' and 'On how many days out of the next 28 days do you intend to eat full meals even while everyone you eat with is dieting?'. The scale had satisfactory reliability (α = .78).

Results and discussion

The mean age of participants was 20.98 (SD = 1.73, range = 17–28). Forty-one percent of participants were Asian/Asian-American, 24 percent were Caucasian, 15 percent were Hispanic, 6 percent were Middle Eastern and 5 percent were African-American. The remaining 9 percent of participants described themselves as biracial. This roughly reflects the ethnic makeup of the university as a whole. The mean BMI in the sample, 22.0 (SD = .82), is a relatively slim body size.

Hierarchical multiple regressions were conducted to examine the effectiveness of the five models in predicting intentions to resist dieting. Each of the five models, beta coefficients, adjusted R^2 values, and change in R^2 values are shown in Table 1. In the first step of each regression, participants' age, ethnicity and BMI were entered. These demographic variables explained 16 percent of the variance in intentions. BMI was a significant predictor, such that thinner participants were more likely to intend to resist dieting. In the second step of each regression, the constructs from one of the five models were entered. Change in R^2 values for the second step of these regressions give the amount of variance explained by the components of each of the five models beyond that explained by the demographic variables.

The constructs in the first model tested, the TRA, explained an additional 6 percent of the variance in intentions, significantly increasing the amount of variance explained by the entire model to 22 percent. Contrary to our expectations, only the attitude measure, and not social norms, was a significant predictor of intentions. To test the TPB, perceived behavioral control was included in the second step of the regression, along with attitudes and subjective norms. As we predicted, perceived behavioral control significantly explained an additional 26 percent of the variance in intentions, increasing the variance explained by the entire model to 48 percent. Attitude remains a significant predictor of intentions.

The third model tested was the HBM. After entering the demographic variables in the first step, the HBM constructs (susceptibility, severity, benefits and barriers) were entered in the second step. These constructs explained an

Table 1. Standardized βs[a] for five models predicting intentions to resist dieting

Variable	*TRA*	*TPB*	*HBM*	*HBM + SE*	*HAPA*
Step 1					
Age	.120[t]	.120*	.035	.004	.040
Ethnicity	–.068	–.085	–.031	–.020	–.033
BMI	–.385**	–.283**	–.253**	–.295**	–.322**
Step 2					
Attitude	.265**	.189*			
Subjective norms	–.079	.064			
Susceptibility			–.355**	–.198*	–.205**
Severity			.062	.059	.061
Benefits			.129*	.121*	
Barriers			–.322**	–.115[t]	
Perc. behav. control		.538**			
Self-efficacy				.452**	.477**
Outcome expectancy					.181**
ΔR^2 Step 1	.16**	.16**	.16**	.16**	.16**
ΔR^2 Step 2	.06**	.32**	.27**	.39**	.40**
Adjusted R^2 final model	.22**	.48**	.43**	.55**	.56**

[t] $p < .10$, * $p < .05$, ** $p < .005$

[a] Standardized βs are taken from the final model

additional 27 percent of the variance in intentions, significantly increasing the amount of variance explained by the entire model to 43 percent. Susceptibility, benefits and barriers were significant predictors of intentions. Benefits and barriers related to intentions in the expected ways, with more perceived benefits and fewer perceived barriers predicting increased intentions to resist dieting. However, the relationship between susceptibility and resisting dieting was in an unexpected direction. The greater the perceived susceptibility to an eating disorder, the lower were the intentions to resist dieting. When self-efficacy was added to the model, it explained an additional 12 percent of the variance in intentions, as predicted, increasing the amount of variance explained by the entire model to 55 percent. Perceived benefits and perceived susceptibility remained significant predictors of intentions, while the power of perceived barriers was substantially attenuated, leaving it only a marginally significant predictor once self-efficacy was included in the model.

To test the effectiveness of the HAPA, the same procedure was used. As before, the demographic variables were entered in the first step. In the second step, the HAPA constructs (susceptibility, severity, outcome expectancy and self-efficacy) were entered. These constructs explained an additional 40 percent of the variance in intentions to resist dieting, increasing the amount of variance explained by the model to 56 percent. Susceptibility, outcome expectancy and self-efficacy were significant predictors of intentions.

Supplemental analyses were conducted to explore the relationship between self-efficacy and perceived behavioral control. The two variables were significantly and highly correlated ($r = .587$, $p < .001$). However, if both variables were entered into the regression models used above, both variables explained significant proportions of variance in behavioral intentions, suggesting that each construct contributes independently to the models. Because self-efficacy and perceived behavioral control were such powerful predictors of intentions, we examined whether any other predictors would explain significant amounts of additional variance once self-efficacy and perceived behavioral control were entered into the equation. By using a forward stepwise procedure in which all the variables considered in these models were candidates for entry, we found that only susceptibility and outcome expectancy explained

additional variance, and this model explained slightly more variance in dieting intentions (59%) than the most powerful of the tested models, the similar HAPA (56%).

According to the current data, college students do think of resisting dieting as a protective factor against eating disorders. All five models predicted intentions to resist dieting to guard against developing eating disorders as well as these models predict other health-protective behavioral intentions (Aiken et al., 1994; Madden et al., 1992; Sutton, 1998; Sutton et al., 1999). This study suggests, then, that risk for eating disorders can be productively thought of in a health behavior context.

Of the five models, the HAPA explained the largest percent of variance in intentions to resist dieting, and the HBM with self-efficacy was nearly as effective. Self-efficacy was a significant predictor of intentions in both models in which it appeared. Perceived behavioral control also explained a large amount of variance, and it carried nearly all of the explanatory power of the TPB, suggesting that beliefs about the controllability of dieting, or about one's ability to resist it, are important predictors of intentions to resist dieting. The TRA explained the smallest amount of variance in intentions to resist dieting of any of the five models.

The relationship between perceived susceptibility and intentions was in the opposite direction of that predicted by the HBM and the HAPA. The more susceptible individuals felt toward getting eating disorders, the less likely they were to plan to resist dieting. This relationship suggests that some participants may have felt a sense of inevitability over having an eating disorder. In addition, severity did not emerge as a significant predictor of intentions in either the HBM or the HAPA. This result is not surprising in light of the limited variability in participants' views on the severity of eating disorders.

It was surprising that perceived norms was not a significant predictor of intentions to resist dieting in the TRA/TPB. Most theories of dieting and susceptibility to eating disorders posit an important role for peer pressure and socio-cultural norms, and yet that relation failed to emerge here, even though our measure of norms had sufficient variance and sufficient reliability for an effect to be detected. Although we measured this construct the way it is typically measured in studies using the TRA, perhaps these measures were too specifically focused on whether family and friends think the individual should resist dieting, and were not focused enough on whether the individual believes that resisting dieting is the normative thing to do. That is, the measure may fail to assess an individual's perceptions of the clear socio-cultural norms (which, with few exceptions, generally support dieting), and it may be those norms that affect the individual's behavior.

Study 2

In Study 2, we examined the ability of the models to predict breast self-exam. Breast cancer is the second leading cause of cancer death among women, after lung cancer (American Cancer Society, 2000). When detected early, breast cancer has as high as a 98 percent five-year survival rate, but when first detected at the most advanced stage, the survival rate decreases to only 16 percent (American Cancer Society, 2000). While women under 30 are at a relatively low risk of developing breast cancer, they are encouraged to perform monthly breast self-exams (BSE), as that is the most common way for them to detect potential breast cancers, since they are not advised to have mammograms until age 40 (American Cancer Society, 2000).

The current study examines the ability of the five models to predict women's intentions to conduct BSE. Because BSE seems to be strongly under the individual's volitional control, we do not expect the addition of self-efficacy or perceived behavioral control to add significant predictive ability, and thus we expect the HBM and TRA will be as good at predicting intentions as the HBM with self-efficacy, the TPB and the HAPA. Again, it is not possible to make clear predictions about the relative effectiveness of the models beyond this, as they have been compared so infrequently.

Method

Participants

One hundred and twenty female undergraduates in a psychology course participated as a part of a class project. All participants were treated according to American Psychological

Association (APA) ethical guidelines (APA, 1992).

Procedure

When students arrived in class, they were told about the study, presented with consent forms and were invited to participate. All students present in class agreed to participate, though male students participated in a different experiment that will be reported elsewhere. Students were reminded that their responses would be anonymous, and they were encouraged to answer each question as honestly as possible. They were instructed to leave items blank if they did not feel they could provide an honest response.

Measures

All model constructs were measured as in Study 1. Only sample items and measures of internal consistency are given below.

Demographic variables Participants reported their age and ethnicity.

Objective risk Participants responded to questions about whether their mother, sister, grandmother or aunt ever had breast cancer, as well as if they had ever had a lump in their breast. If participants endorsed any of these items, they were categorized as having objective risk for breast cancer. Distinguishing between first and second degree relatives has not been found to lead to an increase in predictive power in prior research (Aiken et al., 1994), so it was not done here.

Behavioral beliefs and outcome evaluations Sample behavioral beliefs items include: 'If I performed BSE regularly, I would increase my chances of surviving breast cancer' and 'If I performed BSE regularly, I would detect breast cancer sooner than a physician would'. For outcome evaluations, participants rated how 'good' or 'bad' each of the above outcomes would be.

Attitude toward the behavior The behavioral belief for each outcome was multiplied by its outcome evaluation to create an indirect measure of the attitude toward each item. The scale is sufficiently reliable ($\alpha = .72$).

Normative beliefs and motivation to comply The items were identical to those in Study 1, except they asked about performing BSE instead of dieting.

Subjective norms Each normative belief was multiplied by the corresponding motivation to comply, to obtain indirect measures of subjective norms. The two items were significantly correlated ($r = .59$, $p < .01$), so they were combined to create one score representing the extent to which the individual felt pressured to follow the BSE norms of family and friends.

Perceived behavioral control Perceived behavioral control (from the TPB) was measured with the same two items used in Study 1, reworded for BSE instead of dieting (Sutton et al., 1999). Responses to the two items were significantly correlated ($r = .34$, $p < .01$), so they were combined into one measure of perceived behavioral control.

Susceptibility and severity Susceptibility and severity were measured with the same items as in Study 1, reworded to ask about breast cancer instead of eating disorders. The scales have sufficient reliability ($\alpha = .67$, $\alpha = .66$, respectively).

Benefits Sample items include, 'Doing BSE regularly is beneficial for one's health' and 'Doing BSE regularly can prolong your life'. The scale has satisfactory reliability ($\alpha = .76$).

Barriers Sample items include: 'I would perform BSE, but I do not know how' and 'I would perform BSE but I am worried I will find a lump'. The scale has satisfactory reliability ($\alpha = .76$).

Self-efficacy Sample items include: 'I can perform BSE even if I feel awkward about it' and 'I can perform BSE even if I have to seek out information about how to do it correctly'. The scale has satisfactory reliability ($\alpha = .88$).

Intentions Participants were asked to indicate their degree of agreement with the statement 'I intend to perform BSE monthly' on a seven-point Likert scale from 0 (strongly disagree) to 6 (strongly agree). In addition, participants were

asked to indicate how many times in the next 12 months they intend to perform BSE. Responses to these two items were highly correlated (r = .57, p < .001, n = 113). However, since seven respondents left the second item blank, the first item will be used as a measure of intentions to perform BSE.

Results and discussion

The mean age of participants was 20.99 (SD = 3.44, range = 17 to 45). Thirty-two percent of participants were Asian/Asian-American, 34 percent were Caucasian, 17 percent were Hispanic, 5 percent were Middle Eastern and 5 percent were African-American. The remaining 7 percent of participants described themselves as biracial. Twenty-four percent of participants (n = 29) had some objective risk for breast cancer.

Hierarchical multiple regressions were conducted to examine the effectiveness of each of the models in predicting intentions to perform BSE. The models, beta coefficients (from the final models), adjusted R^2 values and change in R^2 values are shown in Table 2. In the first step of each model, participants' age and ethnic group were entered. These demographic variables explained 6 percent of the variance in intentions. In the second step, objective risk was added to each model. Objective risk did not significantly increase the amount of variance explained by the models. The constructs from each of the models were entered in the third step of each model.

The TRA constructs, attitudes and subjective norms, explained 21 percent of the variance in intentions, significantly increasing the amount of variance explained by the model to 27 percent. Both attitudes and subjective norms were significant predictors of intentions. To test the TPB, perceived behavioral control was added in the third step of the model, along with attitudes and subjective norms. It explained an additional 4 percent of the variance in intentions, increasing the amount of variance explained by the entire model to 31 percent. Both attitudes and norms remained significant predictors of intentions.

The third model tested was the HBM. The HBM constructs (susceptibility, severity, benefits and barriers) were added in the third step of the regression. These constructs explained an additional 13 percent of the

Table 2. Standardized βs[a] for five models predicting intentions to conduct breast self-exam

Variable	*TRA*	*TPB*	*HBM*	*HBM + SE*	*HAPA*
Step 1					
Age	.139[t]	.121	.068	.071	.083
Ethnicity	.141[t]	.130	.179*	.140	.115
Step 2					
Objective risk	.072	.070	.070	.018	.024
Step 3					
Attitude	.335**	.314**			
Subjective norms	.256**	.236**			
Susceptibility			.024	.039	.027
Severity			.074	.056	.065
Benefits			.194*	.111	
Barriers			–.329**	–.086	
Perc. behav. control		.220**			
Self-efficacy				.429**	.444**
Outcome expectancy					.268**
ΔR^2 Step 1	.06*	.06*	.06*	.06*	.06*
ΔR^2 Step 2	.003	.003	.003	.003	.003
ΔR^2 Step 3	.21**	.25**	.13**	.24**	.31**
Adjusted R^2 final model	.27**	.31**	.19**	.30**	.37**

[t] p < .10, * p < .05, ** p < .005

[a] Standardized βs are taken from the final model

variance in intentions, significantly increasing the amount of variance explained by the model to 19 percent. Benefits and barriers were significant predictors of intentions and related to intentions in the expected ways, with more perceived benefits and fewer perceived barriers predicting increased intentions to perform BSE. To test the effectiveness of including self-efficacy with the HBM constructs, the fourth regression included self-efficacy with the HBM constructs in the third step of the model. Self-efficacy explained an additional 11 percent of the variance in intentions, increasing the amount of variance explained by the model to 30 percent. Neither perceived benefits nor perceived barriers remained significant predictors of intentions once self-efficacy was included.

The HAPA was the final model tested. After the first two steps, in which the demographic variables and objective risk were entered, the HAPA constructs (susceptibility, severity, outcome expectancy and self-efficacy) were entered. These constructs explained an additional 31 percent of the variance in intentions to perform BSE, significantly increasing the amount of variance explained by the model to 37 percent. Outcome expectancy and self-efficacy were both significant predictors of intentions, but susceptibility and severity were not.

Self-efficacy and perceived behavioral control were significantly correlated ($r = .334$, $p < .001$). When entering both constructs into the above models, only self-efficacy remained significant, suggesting that the constructs are not conceptually distinct as predictors of BSE. Because self-efficacy was such a powerful predictor of intentions, we examined whether any other predictors would explain significant amounts of additional variance once self-efficacy was entered into the equation. By using a forward stepwise procedure in which all the variables considered in these models were candidates for entry, we found that only attitudes and norms explained additional variance after entering self-efficacy. That model explained slightly more variance (41%) than the HAPA, which was the best of the tested models (37%).

All five formal models were significant predictors of intentions to perform BSE for the early detection of cancer. The HAPA explained the most variance in intentions of the models, and the HBM (without self-efficacy) explained the least. The HBM constructs only explained 13 percent of the variance in BSE intentions beyond that explained by demographic variables and objective risk, and only two of its components (benefits and barriers) were significant predictors of intentions. Self-efficacy explained an additional 11 percent of the variance when added to the HBM. The TRA explained 21 percent of the variance in intentions beyond that explained by the demographic variables and objective risk, and both attitudes and subjective norms were significant predictors. Perceived behavioral control explained an additional 4 percent of the variance. Finally, we should point out that it is surprising that objective risk was not a significant predictor of BSE intentions, as has been found elsewhere (e.g. Aiken et al., 1994). In that study, however, participants were significantly older (mean age = 55) than participants in the current study, and they may have been more aware of their objective risk and more likely to act based upon it.

Conclusions

In the current set of studies, we compared several models of health behavior change to each other, for two different behavioral intentions. The HAPA was the best predictor of intentions to engage in both of the health behaviors. This is the newest of the models and has been studied the least. It should be further evaluated, and more researchers should consider it as a possible basis for interventions.

The first behavior that we tested, resisting dieting to reduce risk for eating disorders, is a behavior that individuals do not have full control over, and that they perform partially in public, in the presence of important others. Therefore, we predicted that the models that included perceived behavioral control (the TPB) and self-efficacy (the HBM with self-efficacy and the HAPA) would be better at predicting intentions to resist dieting than the models that did not include these constructs (the TRA and the HBM). Our hypotheses were supported. The HAPA explained the most variance in intentions to resist dieting, and the HBM with self-efficacy was nearly as effective. Similarly, the TPB, which includes perceived

behavioral control, was a better predictor of intentions to resist dieting than both the TRA and the HBM alone. The results from this study suggest that perceived behavioral control and self-efficacy are important components in predicting intentions to engage in behaviors that are not fully under a person's volitional control.

Unlike resisting dieting, BSE is performed in private and is mostly under the individual's volitional control. Consequently, we did not expect perceived behavioral control or self-efficacy to add significantly to the predictive ability of the models. Our hypotheses were not supported. Perceived behavioral control and self-efficacy added significantly to the ability of the models to predict intentions to perform BSE, and self-efficacy explained as much variance for intentions to conduct BSE as it did for intending to resist dieting. However, perceived behavioral control accounted for much less of the variance in intentions to conduct BSE than for intentions to resist dieting.

Our examination of the relationship between self-efficacy and perceived behavioral control may shed some light on these findings. For resisting dieting, a behavior that is not fully under an individual's volitional control, both self-efficacy and perceived behavioral control exerted significant independent effects on behavioral intentions (as found when both were entered into the regressions together). In contrast, only self-efficacy (when both were entered together) exerted significant effects on intentions to conduct breast self-exam, which is more strongly under an individual's volitional control. Thus, it may very well be the case that when a behavior is not under full volitional control, self-efficacy and perceived behavioral control tap into different constructs—different aspects of the uncontrollability and difficulty of engaging in the behavior—giving a more nuanced picture of the individuals' beliefs. When a behavior is fully under volitional control, however, these different aspects of uncontrollability and difficulty may converge into one primary construct.

Finally, it should be noted that this study is limited in that we do not measure actual behaviors, but rather behavioral intentions. It is possible that different constructs would have emerged as significant predictors if we had measured behaviors. However, most studies find that intentions (and the constructs that predict them) are good predictors of behaviors. And of course, the TRA and TPB are only designed to predict intentions.

Nevertheless, these studies highlight the importance of comparing multiple models in predicting intentions to engage in health behaviors. The fact that our hypotheses in the second study were not completely supported is an important reminder that without empirical research, it is hard to know a priori which model will be best at predicting which behaviors. Without that knowledge, it would be difficult to choose a model on which to base an intervention. The current study poses several potential avenues for further investigation. As more researchers begin directly testing multiple models, it may be possible to begin classifying particular health behaviors according to which models work best at predicting those behaviors.

Notes

1. The newer articles on the HAPA do not include severity in the threat component (Schwarzer, 1999, 2001), but we include it in our analysis for completeness.
2. Because adding more independent variables to a model can only increase R^2, we report the adjusted R^2 throughout this article to avoid giving an advantage to the models that happen to have larger numbers of predictors.

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