

A MISSING PIECE OF THE TRANSTHEORETICAL MODEL APPLIED TO EXERCISE: DEVELOPMENT AND VALIDATION OF THE TEMPTATION TO NOT EXERCISE SCALE

HEATHER A. HAUSENBLAS^{1,*}, CLAUDIO R. NIGG², ERIN A. DANNECKER¹,
DANIELLE SYMONS DOWNS¹, R. ELLIS GARDNER¹, ELIZABETH A. FALLON¹,
BRIAN C. FOCHT¹ and MICHAEL G. LOVING¹

¹*University of Florida*

²*University of Rhode Island*

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Building upon previous research examining the Transtheoretical Model (Prochaska & DiClemente, 1986), this paper presents two studies on the development and validation of a Temptation To Not Exercise Scale. Exploratory and confirmatory factor analyses results showed evidence of two factors, labeled Affect and Competing Demands, which had adequate internal consistency scores. Additional validity of the temptation constructs was demonstrated by the significant decrease of the Affect and Competing Demands scores across the stages of change and the negative relationship between self-efficacy and the Affect and Competing Demands scores. The Temptation to Not Exercise Scale may represent a useful component in the application of the Transtheoretical Model to help understand, predict, and explain exercise behavior.

KEY WORDS: Transtheoretical Model, temptation, exercise.

Considerable evidence exists to support the suggestion that physical activity participation contributes positively to both physical and psychological health (United States Department of Health and Human Services [USDHSS], 1996). Despite the numerous benefits of exercise, up to 60% of United States adults are sedentary (Caspersen *et al.*, 1994), and approximately 50% of sedentary adults beginning an exercise program will drop out within six months (Dishman, 1988). To better promote the adoption and maintenance of regular exercise, some researchers have applied theories that view exercise behavior as a dynamic and multidetermined process. One relevant framework of behavior change is the Transtheoretical Model (TM; Prochaska and DiClemente, 1984), which includes five constructs (i.e., stages of change, processes of change, self-efficacy, decisional balance, and temptation) that are integrated to describe, explain, and produce behavior change (Prochaska and DiClemente, 1986; Prochaska and Velicer, 1997).

The stages of change construct consists of five stages: precontemplation (not intending to make changes), contemplation (intending to make changes in the foreseeable future), preparation (immediate intention to change), action (actively engaging in the new behavior), and maintenance (sustaining change over time). The processes of change are defined as

*Corresponding author. Tel.: 352-392-0584 ext. 1292; Fax: 352-392-5262; E-mail: heatherh@hhp.ufl.edu.

overt and covert activities that individuals use to alter their experiences and environments to modify behavior change. There are 10 processes that are divided into two higher-order factors representing experiential (i.e., where relevant information is generated by an individual's own actions or experiences) and environmental (i.e., where the information is generated by environmental events) processes of change (Prochaska *et al.*, 1992). Decisional balance focuses on the benefits (pros) and costs (cons) of a behavior and is thought to be important in the decision-making process and, hence, in behavior change (Janis and Mann, 1977). Self-efficacy is a judgement regarding one's ability to perform a behavior required to achieve a certain outcome (Bandura, 1997). Temptation is the intensity of urges to engage in a specific habit when in the midst of difficult situations (Grimley *et al.*, 1994). Temptation and self-efficacy function inversely across the stages of change, with temptation being a better predictor of relapse in the smoking literature (Redding and Rossi, 1999). For example, in the maintenance stage, where the individual has successfully altered the behavior for at least six months, temptation is one of the best predictors of relapse (Redding and Rossi, 1999). This is supported with longitudinal studies of smokers where some participants were abstinent for long periods of time, but still had moderate levels of temptation (Redding *et al.*, 1989).

Over the last decade the TM has been increasingly applied to examine exercise behavior in cross-sectional studies and to a lesser extent in longitudinal and quasi-experimental interventions studies. In fact, a literature search identified over 50 studies from 1987 to 1999 that have validated, expanded, applied, and challenged the stages of change, self-efficacy, decisional balance, and processes of change constructs of the TM for exercise behavior. No studies, however, were located that examined the temptation construct for exercise behavior despite its use in other health behaviors (e.g., Hudmon *et al.*, 1997; Redding and Rossi, 1999; Rossi *et al.*, 1990; Velicer, DiClemente *et al.*, 1990). The development of an exercise temptation measure is warranted due to: (a) the success of the TM constructs of stages of change, self-efficacy, processes of change, and decisional balance in understanding exercise motivation; and (b) the suggestion that more research is needed examining the complete TM (Cardinal, 1999; Prochaska and Velicer, 1997). Thus, the purpose of the current research was to develop and present initial validation of a Temptation to Not Exercise Scale. Two studies were undertaken to achieve this purpose.

STUDY 1

The purpose of Study 1 was to develop the Temptation To Not Exercise Scale, explore its underlying structure, and provide initial evidence of its psychometric properties.

METHOD

Participants

Participants were 345 male and female undergraduate students (M age = 20.8 years, $SD = 2.4$; 53.3% males). Approximately 70% of the students were Caucasian, followed by Hispanic (11.0%), African American (7.5%), Asian (2.9%), and other (0.9%). The average body mass index of the participants was within the healthy range ($M = 23.5$, $SD = 3.9$; Jequier, 1987).

Measures

Temptation to Not Exercise Scale. Development of the Temptation to Not Exercise Scale followed a sequential method of scale construction to ensure content and internal validity (Jackson, 1970, 1971). An initial pool of 70 items was generated by the authors based on their own experiences, interviews with individuals in each of the five stages of change, and from reviewing self-efficacy and temptation scales developed for other health behaviors. Content validity was established by having three exercise science experts, familiar with the temptation construct, review the scale for appropriateness, readability and comprehension. This resulted in the elimination of 20 items, with the final scale containing 50 items. The items were preceded by the sentence "Using the scale below, please indicate how TEMPTED you are NOT to exercise in the following situations". The responses were rated on a scale ranging from 0% (not at all tempted) to 100% (extremely tempted). For example, if a participant was tempted to not exercise when faced with a particular situation they would report a higher percentage than when not tempted.

Procedure

The study was approved by the University's Institutional Review Board. The participants completed an informed consent form prior to receiving the 50-item temptation scale. They voluntarily and anonymously completed the questionnaire during class time. Completion of the questionnaire took approximately 10 minutes.

RESULTS

Missing data was minimal (<2%) and, therefore, random pairwise deletion was used where appropriate. Principal component analysis (PCA) with a varimax rotation was performed to explore the structure among all items while maintaining the independence of the resultant components. Horn's (1965) parallel analysis and the tables provided by Lautenschlager (1989) suggested retaining three components. The Scree plot (Figure 1), however, suggested two components. The eigenvalue greater than 1 rule suggested 10 components being retained, but was not included in any subsequent analysis as it was deemed too liberal of an estimation (Lautenschlager, 1989). Considering: (a) the Scree plot; (b) that only 4 items loaded uniquely on the third component; and (c) that the maximum contributed variance for components 3–50 were less than 4% each, the 2 component solution served as the basis for item reduction. Based upon the item content, the components were labeled Affect and Competing Demands.

The number of items representing the two components allowed item reduction without losing substantial item variance or compromising the internal consistency. An item was retained on a component if it loaded greater than .40 on the target (primary) component and it did not load higher than .20 on the non-target (secondary) component. This ensured the uniqueness of the components by deleting potentially complex items. The resultant scale was further reduced using the following criteria: (a) relatively low primary component loadings (<.50); (b) item content overlap; (c) double barreled item; (d) long and wordy items; and (e) extreme means of individual items. Finally, the depth and breadth of the constructs were considered when retaining items. This process resulted in retaining five

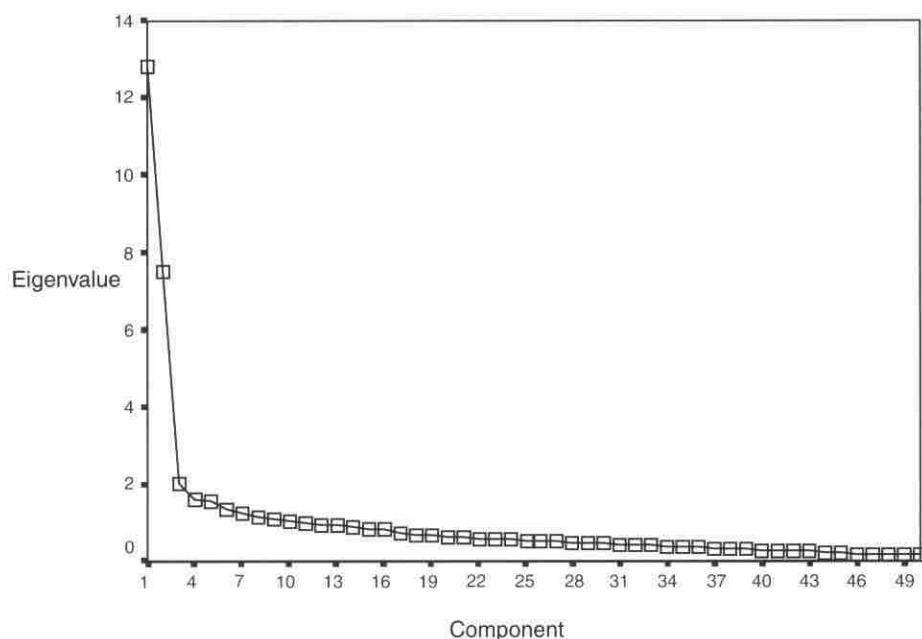


Figure 1 Scree Plot for the Temptation to Not Exercise Scale.

Table 1 Principal component solution and mean (M) and standard deviation (SD) scores for Temptation to Not Exercise Scale

	Loading	M	SD
Component 1 AFFECT ($\alpha = .85$)			
When I am angry	.80	23.30	28.22
When I feel satisfied	.80	23.92	29.67
When I am alone	.79	26.40	29.67
When I am stressed	.80	31.29	30.57
When I am out of shape	.78	28.60	31.03
Component 2 COMPETING DEMANDS ($\alpha = .85$)			
When I feel lazy	.79	59.47	30.02
When I feel that I don't have the time	.89	67.65	28.58
When family events/situations interfere	.73	64.45	27.62
When I am busy	.80	62.35	28.48
When I have work to do	.77	58.87	29.37

Note: Principal Component Analysis with Varimax Rotation; $N = 345$.

items per component. The item descriptives, loadings, and internal consistencies (coefficient alphas) are presented in Table 1.

STUDY 2

The purposes of Study 2 were to: (a) confirm the factor structure of the Temptation to Not Exercise Scale identified in Study 1; (b) further examine the scale's psychometric properties; and (c) provide preliminary validation of the Temptation to Not Exercise Scale with the

TM constructs of the stages of change and self-efficacy. Expanding upon previous health behavior literature addressing temptation, the following hypotheses were advanced: (a) temptation to not exercise would decrease across the stages; and (b) temptation to not exercise would be inversely related to barrier self-efficacy.

METHOD

Participants

Participants were 309 male and female students (M age = 20.7, SD = 2.0), 60.3% male. Seventy four percent (74.1%) of the students were Caucasian, followed by Hispanic (10.4%), African American (9.1%), Asian (4.2%), and other (1.6%). The distribution of participants by academic year was 37% senior, 23% junior, 29% sophomores, 11% freshmen, and 1% graduate. Participants mean body mass index was within the healthy range (M = 24.0, SD = 3.8).

Measures

Stages of Change Questionnaire (SCQ). The SCQ consists of five items, one for each stage of the TM. The precontemplation item is operationalized as having no intention to begin regular exercise within the next six months. The contemplation item is defined as intending to begin regular exercise within the next six months. The preparation item is defined as intending to begin regular exercise within one month. The action item is defined as regularly exercising, but for less than six months. Finally, the maintenance item is defined as regularly exercising for more than six months. Respondents indicate which of the five items is most reflective of their current exercise behavior. Exercise behavior is defined as "any planned physical activity (e.g., brisk walking, aerobics, jogging, bicycling, swimming) performed to increase physical fitness. Such activity should be performed 3–5 times per week for 20–60 minutes per session. Exercise does not have to be painful to be effective, but should be done at a level that increases your heart rate and cause you to break a sweat". This type of staging assessment was recommended by Reed *et al.* (1997) as a valid and reliable staging method.

Self-efficacy Questionnaire. Self-efficacy was measured with a 12-item barrier self-efficacy scale (McAuley and Mihalko, 1998) designed to tap participants' perceived capabilities to exercise in the face of barriers to participation (e.g., bad weather, lack of interest/boredom, pain and discomfort, exercising alone). Participants were required to rate their degree of confidence that they could exercise in the event that barrier circumstances were to occur on a 0–100% scale (0% = no confidence at all; 50% = somewhat confident; 100% = completely confident). The coefficient α for the Self-efficacy Questionnaire in the present study was adequate (α = .87).

Temptation to Not Exercise Scale. Temptation was measured using the 10-item scale developed in Study 1.

Procedure

Following the University's Institutional Review Board approval, the participants completed an informed consent form prior to receiving the questionnaire during class time. Completion

of the questionnaire took approximately 10 minutes. The order of scale administration was counterbalanced to avoid biased responding.

RESULTS

Similar to Study 1, missing data was minimal (<2%) and, therefore, random pairwise deletion was used where appropriate. One individual did not answer the LTEQ correctly and was, therefore, excluded from the stage validation analysis. Based on the SCQ, 64.8% of the sample was classified in the maintenance stage, followed by 21.8% in the action stage, 8.5% in the preparation stage, 3.9% in the contemplation stage, and 1.0% in the precontemplation stage. The mean LTEQ scores (in METs) significantly differentiated the stages of exercise behavior change and were: precontemplation = 30.00 ($SD = 12.73$), contemplation = 28.83 ($SD = 20.78$), preparation 35.21 ($SD = 22.30$), action 46.35 ($SD = 19.82$), and maintenance = 49.90 ($SD = 23.43$), $F(4, 299) = 4.86$, $p < .001$. Post hoc analysis revealed that individuals in the contemplation and preparation stages scored significantly lower than individuals in the maintenance stage ($p < .05$).

Confirmatory factor analysis (CFA) using maximum likelihood estimation was used to evaluate the appropriateness of the temptation structure identified in Study 1. To assess the fit of the specified model three different indices were calculated representing absolute, comparative and residual aspects of fit. These included: (a) the chi-square/degree of freedom ratio (χ^2/df); (b) the comparative fit index (CFI); and (c) the average absolute standardized residual (AASR). For the χ^2/df ratio, values less than two indicate good overall model fit (Marsh *et al.*, 1988). A χ^2/df ratio above five indicates unacceptably large differences between the parameterized model and the data. The CFI is a measure of the proportion of the variation and covariation explained by the specified model (Bentler, 1990). The index is bounded by 0 and 1, with 1 indicating perfect fit. CFI values greater than .90 indicate good model fit. The AASR is an index of the discrepancy between the specified model and the data (Bentler, 1990). Generally, values between 0 and .06 indicate good model fit with 0 indicating perfect fit. It is important to note that there is no single accepted index of model fit. Use of several measures of fit, representing a variety of conceptual approaches to the problem of assessing model adequacy, provides some protection against the possibility of model misspecification and sampling error (Marsh *et al.*, 1988).

The correlated two factor model fit the data adequately ($\chi^2 = 125.55$, $df = 35$; $\chi^2/df = 3.59$; CFI = .93; AASR = .07) and is presented in Table 2. The standardized loadings of the items range from .54 to .87 with all being significant ($p < .001$). The correlation between the two factors is small, $r = .24$, $p < .01$. For this study, internal consistency values were .81 and .86 for Affect and Competing Demands, respectively.

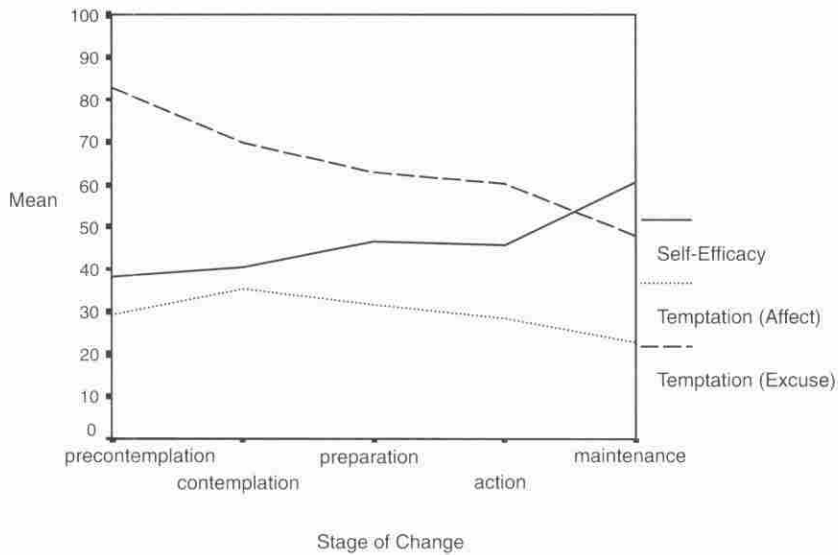
Initial construct validation was conducted through a means comparison of the temptation scales across the stages of change using one-way analysis of variance (ANOVA). The mean scores are depicted in Figure 2, with self-efficacy included for comparison. The Affect scale ANOVA approached significance, $F(4, 301) = 2.34$, $p = .06$. The Competing Demands scale was significant across the stages, $F(4, 301) = 7.83$, $p < .001$, with the maintenance stage participants being less tempted to not exercise than the contemplation, preparation, and action stage means ($p < .05$). Self-efficacy was significantly different across the stages, $F(4, 302) = 16.01$, $p < .001$, with maintainers scoring higher than contemplators, preparers, and action stage participants ($p < .05$). As hypothesized, the

Table 2 Confirmatory factor solution and mean (M) and standard deviation scores (SD) for Temptation to Not Exercise Scale

	Loading	M	SD
Factor 1 AFFECT ($\alpha = .81$)			
When I am angry	.77*	22.00	27.42
When I feel satisfied	.54*	28.66	30.29
When I am alone	.65*	26.79	29.05
When I am stressed	.69*	24.68	30.39
When I am out of shape	.75*	24.20	28.05
Factor 2 COMPETING DEMANDS ($\alpha = .86$)			
When I feel lazy	.56*	50.73	30.60
When I feel that I don't have the time	.78*	54.34	31.04
When family events/situations interfere	.66*	57.79	29.90
When I am busy	.87*	51.56	30.51
When I have work to do	.82*	50.76	30.59

* $p < .001$; $N = 308$, $\chi^2 = 125.55$, $df = 35$; CFI = .93; AASR = .07.

Note: Correlation between the two factors = .24; $N = 308$.

**Figure 2** Self-efficacy and Temptation mean scores across the stages of change.

Affect and Competing Demands scales were inversely related to self-efficacy (r 's = $-.54$ and $-.51$, respectively, $p < .01$).

DISCUSSION

The temptation construct of the TM has been examined in a variety of health behaviors (Prochaska and Velicer, 1997). No located research, however, in the exercise domain has been undertaken with this construct. Therefore, two studies were undertaken to develop and provide initial validation of a Temptation to Not Exercise Scale. Study 1 examined the

factor structure of the temptation construct for exercise behavior. Two factors were identified and labeled Affect and Competing Demands. The Affect factor addressed affective components of temptation such as anger, stress, and satisfaction. Compared to temptation scales developed for other health behaviors, positive and negative affect did not differentiate (e.g., Velicer *et al.*, 1990). This may reflect differences between acquisition and cessation behaviors. For example, when adopting a new health behavior, such as exercise, positive or negative affect may tempt an individual to revert to unhealthy behaviors. In contrast, when in the process of terminating an unhealthy behavior (e.g., smoking) positive affect may not serve the same role as negative affect. However, this speculation should be investigated through direct comparisons. The Competing Demands factor contained items representing laziness, lack of time, and being too busy. The content of this factor seems to be specific to the exercise area and encompasses the most frequently cited reasons for ceasing exercise or having a sedentary lifestyle (e.g., Sports Council and Health Education Authority, 1992).

Study 2 confirmed the existence of the two factors and revealed adequate internal consistency scores. Additional validity of the temptation construct was demonstrated by the decrease of the two factors across the stages of change. As hypothesized, individuals' temptations to relapse diminished with more involvement in exercise. This finding replicated previous research (Hudmon *et al.*, 1997; Velicer *et al.*, 1990) confirming the TM (Prochaska and Velicer, 1997).

Temptation appears to be the most important in the later stages (i.e., action and maintenance). Specifically, there was a more pronounced change in the later stages indicating that temptation becomes an important construct for maintenance of behavior change. In the action and maintenance stages temptation to not exercise decreased, but did not "disappear completely". This was consistent with the research by DiClemente and his colleagues (DiClemente *et al.*, 1985) who found that in the action and maintenance stages temptation to not smoke decreased steadily over time, but did not disappear completely until three to five years of continual smoking abstinence. Longitudinal research is needed to examine this possibility for exercise behavior.

The negative relationship between self-efficacy and temptation provided evidence of the discriminant validity of the Temptation to Not Exercise Scale (as the constructs were not collinear) and also indicated the temptation scale's potential importance as a predictive component for exercise behavior within the TM. Based on this finding, temptation may represent a useful component for the application of the TM to exercise behavior by providing a more complete picture of the exercise behavior change process. Further exploration of the association between temptation and exercise is necessary to validate these assertions. Preferably, this research should be conducted with longitudinal designs.

It should be noted that the scales were not standardized, owing to the requirement for absolute and relative comparison between the resulting factors of the temptation scale. The affective component was less endorsed across all stages, possibly being not as important to target for interventions or possibly endorsed by fewer participants within this sample. It is evident that the Competing Demands component is very salient for this population and should be addressed in exercise interventions targeting college students. This difference in endorsement (i.e., importance) of these temptation factors may vary for other age groups and remain to be examined by future researchers.

The current studies allow for the next wave of research with the temptation scale of confirming its structure and relationship to behavior (stage) in other samples. Specifically, exploration of the role of temptation in exercise behavior within different age groups (e.g.,

older adults, middle aged, adolescents) and fitness levels (e.g., unfit, obese) are needed. Furthermore, the temptation scale allows for a more rigorous examination for the existence of the termination stage which is characterized by complete self-efficacy for the health behavior and no temptation to revert to the unhealthy behavior (Prochaska and Velicer, 1997). Preliminary evidence exists for this stage in the smoking and exercise literature (Cardinal, 1999). However, there is considerable debate if this stage is applicable for acquisition behaviors in general (Lee *et al.*, 1999; Prochaska and Marcus, 1994).

As an understanding of the influence of temptation on exercise increases, use of the inventory may assist with the preparation for relapse and eventually the prevention of recidivism from exercise training regimens. If employed during exercise interventions, temptations should be used to determine where relapse prevention efforts should be targeted for maximum effectiveness. Thus, it is conceivable that the ability to assess temptations as a construct of the TM may contribute to the development of more appropriate exercise prescription guidelines and facilitate the attainment of national physical activity recommendations among a greater proportion of the population (USDHHS, 1996).

There are several limitations of the study. First, the studies sampled only one university, which largely represented an active population. This may have impacted the generalizability of the results and the power to detect stage difference in Study 2. Second, owing to the cross-sectional design of this study, it is impossible to clarify if the differences between the stages are antecedents or consequences of behavior change. It is recommended that longitudinal and experimental research designs be employed to address these issues before interventions are designed. Finally, research incorporating all the constructs of the TM (i.e., stages, processes of change, self-efficacy, temptation, and decisional balance) is needed before temptation can be considered as an integral part of the model.

In summary, results of the present research provide support for the following three conclusions. First, the temptation scale demonstrates adequate psychometric properties. Second, temptation is a multi-dimensional construct that is conceptually distinct from barrier self-efficacy. Finally, temptation is associated with other components of the TM and may represent a useful component in the application of the TM to exercise behavior.

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